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THE ANTHROPOGRAPHY OF SOME GREAT CITIES.

A STUDY IN DISTRIBUTION OF POPULATION.

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The glamour that hangs about Imperial Rome is not strange in a world whose educated people have mostly had a touch of classical training. At any rate, students of the classics are willing to think of classic days as glorious days and of ancient Rome as the most glorious of cities. A part of this glory, it is commonly believed, lay in the great number of her inhabitants. Perhaps the attitude of historians is fairly reflected by Merivale:

"On the whole, the computations alleged on all sides are little more than one guess against another; we may be content to strike a balance between the most plausible of several, and set our own figures at one million."†

At one time there was much argument about this matter, which seems to run back for the most part to a discussion in Gibbon's "Decline and Fall of the Roman Empire," with an estimate of 1,200,000 inhabitants. Of course, the only way to find the number of people in a city is to count them, but Gibbon's opinions were written about the time of the American Revolution, before the days of the modern scientific census. When our forefathers had won in battle the right

* I have to acknowledge a deep obligation to the gentlemen who have spared no pains in collecting for me ward maps, data of area and general information about their cities: Mr. Ralph E. Blount, Chicago; Mr. Chas. W. Ammerman, St. Louis; Asst. City Engineer Frederic H. Fay, Boston; Mr. Henry E. Jefferson and Prof. W. S. Tower, Philadelphia; Dr. Ellsworth Huntington and Mr. Jacob Riis, New York, and Director North, of the United States Census, Mayors, and other officials of many cities have extended courtesies.—M. J.

† "General History of Rome," London, 1875, p. 676.

to representative government, the census became necessary for the apportionment of the representatives among the people, so the first count on our continent was made in 1790. There was a census made in Sweden about 1750, but most of Europe began the work about 1800. Now it is necessary to recognize two facts in this connection: First, that at the time of Gibbon's estimate no cities out of Sweden had been accurately counted, so that scholars of that day had no facts about the size of cities before them, and second, that the counts made later showed clearly that there was then no city of a million people in the world, as far as accurate knowledge reached. There can be little advantage in dwelling on the size of Oriental cities that have never known a census. Yet in China we still find Peking estimated all the way from 700,000 to 2,000,000 inhabitants, by observers who are careful, conscientious and certainly better fitted to make an estimate than any ancient Roman could be, for they have lived in cities of known size that could serve them as a basis of comparison. All the ancient statements are indirect, but it is probable that if Cæsar and Cicero had both given us estimates of the size of the Rome they knew, the numbers would have differed widely and would have had little relation to actual facts. There is no way to ascertain the size of a city but by actual count. Modern data do, however, enable us to apply a criterion to estimates like these, a criterion that did not exist for Gibbon.

All the million-cities that we know to-day are very modern. They belong to the nineteenth century and the great industrial expansion which followed the introduction of steam as a motive power for industry and transportation. The first to attain that figure was London, in 1802, then Paris in 1850, New York in 1870, Vienna in 1878, Berlin in 1880, Tokio, Chicago and Philadelphia in 1890, Calcutta in 1900, and Buenos Aires in 1906.* The mind that dwells a little on these dates will not fail to be impressed with the great newness of this thing, the city with a million people, always provided that we keep on the safe ground of scientific census taking. The growth of these cities has accompanied the transfer of great masses of workers from agricultural to industrial occupations, a fact established by our census work in a way no ancient migration of people was ever established, nor any change in the habits and life of any people of old. We are not limited to records of observers' impressions, but we have made painstaking and costly measurements. There can be no question that our modern million-cities are a product of modern industry.

* The dates are only approximate, since the census is only taken at recurrent epochs.

It appears likely, also, that they are in some measure a result of geographic conditions, for each of them lies at a natural concentration point on an agricultural lowland or basin, usually open to the sea. A glance at the relief map of Europe shows the north occupied by a great lowland plain between the British and Scandinavian uplands on the north and west, and the ridges that encompass and traverse the Mediterranean on the south. This plain is unequally divided between the foremost powers of Europe, Great Britain, France, Germany and Russia. Central on the British plain is London; on the French, Paris; on the German, Berlin; while Moscow, in the centre of the Russian plain, symbolizes the interior, land empire of Old Russia, and St. Petersburg suggests modern Russia's aspiration to take part in the affairs of the outer world. A little south of this northern plain, beyond the Saxon and Bohemian mountains and the Carpathians, lies the next greatest plain of the continent, that of Austria-Hungary, with Vienna at its western entrance. Buenos Aires is the commercial and cultural focus of the great plains of temperate South America, as Chicago is of the great plains of our continent. If Philadelphia and New York derive some of their significance from the coastal plains of the Atlantic, New York preponderates principally because easy water and rail communication with Chicago enables that, the country's greatest port, to share in the vigorous life of the continental interior. For India, a glance at the relief map shows a broad lowland strip sweeping along under the Himalayas from the mouth of the Ganges to that of the Indus. Why should Calcutta be the million-city rather than Karachi at the western end of the belt, one might ask? Because the rain falls and the people live at the other end. Nearly half the people of India—nearly as many as all the people of North America—live on that lowland between Calcutta and Delhi, in a strip little over 200 miles wide and 1,000 long. It is this enormous agricultural population, poverty-stricken though it be, that maintains Calcutta. Tokio in Japan lies on the streams that drain the greatest plain in the Empire, amid the densest population on the earth, if its large proportion of unproductive land is considered. And Tokio is laying the tribute of commerce on the lands beyond the sea nowadays just as London has done for two or three centuries. And the great cities of the plains owe their growth not so much to the goodness of the soil of plains as to the ease with which products, whether of farm or factory, are moved across them *in any direction.* In this regard the ocean is the great plain of the earth.

The huge manufacturing activities of these places cannot divorce

them from the plains that Professor Penck has called their sustenance spaces. If many men have abandoned agriculture to take up industry in these cities, this industry must needs handle the products of agriculture and increase its importance to the nation. Not merely are the cities named above dependent on their plains, but we may be sure that other great cities will grow up in the future in similar condition at similar points, until men materially change their relations to the earth. Warsaw will soon attain million rank on Russia's plain, Budapest on that of Hungary, Hamburg-Altona has already probably reached it. In America, New Orleans will become premier city, potentially at least, as soon as we do for the Mississippi what the Germans have done for the Rhine. In those days it is hard to see how New York-Chicago will maintain the lead over St. Louis-Kansas City-New Orleans that will then be based only on the economic momentum of the past.*

Here are official data for a number of these cities:

TABLE I.

YEAR.	CITY.	POPULATION.	AREA IN SQ. MILES.	PEOPLE PER SQ. MILE.
1901.....	London	4,537,000	117	39,000
1900	New York.....	3,437,000	327	11,000
1901.....	Paris	2,657,000	30	88,000
1905.... ...	Berlin.....	1,878,000	25	83,000
1900	Chicago	1,699,000	180	9,000
1900.....	Vienna.....	1,648,000	67	25,000
1900.....	Philadelphia.....	1,648,000	128	11,000
1901.....	Calcutta.....	1,005,000	29	35,000
1901.....	Bombay.....	776,000	22	35,000
1900.....	St. Louis.....	575,000	61	10,000
1900.....	Boston.....	561,000	43	14,000

The city of greatest density of population appears to be Paris, with 88,000 people to the square mile. For Rome the area is definitely ascertainable from the well-preserved remnants of the Aurelian Wall. The space contained within this is 4.47 square miles. Had

* Although Constantinople has never had a census, it is commonly regarded as of million size, or near it, the only city of that magnitude in the Mediterranean region, where all the plains are small, the population mostly thin. It has no tributary plain behind it—at least unless Russia gets it in her power—nor is it the creature of modern industry. There is not a little in its circumstances that may seem to remind us of ancient Rome. "No modern industry lives within her walls. The great mass of the population of Constantinople is unproductive and impoverished, and lives directly or indirectly on the city's character as central point of the Turkish Empire and Islam." (Philippson, "Mittelmeergebeit," Teubner, 1907, p. 242.) Yet the railways and many lines of Turkish coast steamers are completely modern, and if replaced by the ancient equivalents in land and sea vehicles, would be positively earth encumbering. Islam means something to this city that is without parallel elsewhere. The Moslem is religious as the west nowhere is, and as the Imperial Roman certainly was not. He spends his whole life, Lord Cromer tells us, consciously in the presence of his Maker. A religion that builds a Mecca railroad as Islam is doing must have enormous significance for its capital city.

it been as densely settled as the Paris of 1901, central on the great Paris basin, fed by steamship and locomotive and housed and equipped with the appliances of modern civilization, old Rome would have contained 404,000 inhabitants. To put two million people within the Aurelian Wall necessitates the supposition of a density of 447,000 to the mile! One million, a density of 223,500! We have all heard of the teeming populations of the East. Bombay is the densest eastern city that has been counted, yet Rome, if peopled as Bombay is, would have contained 156,000 inhabitants. Bombay is head city of a province twice as large as Italy, with 26,000,000 people. It is the point where rail and steamer meet for a good part of the intercourse between Britain and her Indian Empire. Something will probably be said of Rome's suburbs and some attention will be given to modern suburbs below; but, after all, suburbs must not be taken as larger than the city itself. On all analogies we must feel that the size of the ancient city has been exaggerated. Yet the analogies we have used are entirely too favourable to Rome, for it was certainly without the modern machinery for sustaining a great population in a small space, where they must be fed and supplied from without. That the old population was less than 500,000 will be confirmed by a study of the grading of population within the cities of to-day.

There are not many people in the world in comparison with its area. Texas would hold them all and give each man, woman and child a square space seventy feet on each edge. They could *stand* much closer than that. Two thousand people can stand in a mile-long line very easily. They will have two and two-thirds feet between the centers of their bodies then. A square mile so covered would have 4,000,000 on it and the whole 1,500,000,000 of the world's people could stand so in the little State of Rhode Island. So much of that State would be still unoccupied that each could find place to lie down without needing to trespass on his neighbour's ground. In crowds on public occasions people doubtless gather more closely than that, but for their "home space," to again quote Professor Penck, it is doubtful if all the multiplication of stories in crowded city quarters ever brought 500,000 people to live in one square mile or on a smaller space at that rate.

The Eighth Assembly district in New York in 1900 contained 98 acres of ground and was peopled at the rate of 471,040 people to the square mile. This is probably the most densely settled spot on the earth. Including such streets and open spaces as it contains, this allows each man, woman and child a square seven and three-quarters

feet on an edge. It is not strange that the street figures largely in the life of people here. The following table shows the greatest densities within the various cities:

TABLE II.

		ACRES.	DENSITY.
New York	* Ward 10	110	418,000
Bombay	Kumbharwada	?	383,000
London	Spitalfields	88	204,000
Paris	3rd Arrondissement	1892	198,000
Calcutta	Colootola	?	179,000
Berlin	Südliche Rosenthaler Vorstadt	408	173,000
Philadelphia	Ward 3	122	129,000
Vienna	Josefstadt	259	126,000
Boston	Ward 8	166	111,000
Chicago	Ward 16	471	86,000
Baltimore	Ward 18	192	77,000
St. Louis	Ward 16	244	56,200

* In the table and map for New York, *wards* have been used, and not Assembly districts, as no map of the latter could be obtained.

The three densest contiguous wards in New York, the 10th, 11th, and 13th, have a combined area of 413 acres and a population density of 365,000 to the mile. The whole twenty-eight square miles of Manhattan Island have a "density" of 97,000, which again is unparalleled in the world for such an area. The four densest contiguous boroughs in London: Shoreditch, Finsbury, Stepney and Bethnal Green, have a total area of five and nine-tenths square miles—much more than ancient Rome. On this live 639,380 people—117,000 to the mile. Was old Rome more densely peopled than the same area in the heart of modern London, active, feverishly active, as the Mediterranean world never knew activity, making curious wares for the people beyond the seas who send back food and the raw material of industry by fleets that carry in a day what all the shipping of classic days could not have moved in years?

But any investigation into the size of cities meets a difficulty at the outset in the question, "What is a city?" What the English call the City of London had, in 1901, 38,000 people; the County of London, 4,538,000; Metropolitan London, 7,114,000. Which is "London"? The municipalities of Spain and Latin America always include areas that are absolutely rural. Thus Murcia, Spain, which is credited in all the handbooks (in 1900) with 111,539 inhabitants, has only 32,000 of them living together in an urban group.* So

* *Petermanns Mitt. Literaturbericht*, 1906, p. 188.

other cities too: Barbacena, Brazil, is cited as having 57,850 people. The village is only of 5,000 people; the rest scattered about the country.* In all probability Colombia has a number of "cities" that are municipalities of this sort. On the other hand, even Greater New York does not include the whole of the essential city at the mouth of the Hudson. Jersey City and Hoboken must be included and probably also Newark. It is the deep water for steamers that makes the city there and not the shore. So the city at the mouth of the Charles includes Cambridge, Somerville and Chelsea as well as Boston.

For a comparative study of cities it is plain that the geographer needs some urban unit more definite and unvarying than the district of one city government. And such a conception is familiar enough to all. Close occupation of the land with buildings constitutes the city character, and this closeness may be made our criterion. If there are but a few hundred people to the square mile, our conception of a city is not satisfied. The high price of land that characterizes cities comes of occupation so close as to make competition for ownership. The improved paving, lighting and policing all depend on the gathering of numerous tax-payers into a small space. The better theatres, concerts, libraries and schools are possible only because a great number of potential patrons are gathered together.

It has long been recognized that a fair idea of a people's occupation and mode of life can be gathered from the density of their distribution through their territory. Thus Wiechel,† gives the correspondences between density of population and occupation, which he illustrates by geographical examples:—

TABLE III.‡

DENSITY.	OCCUPATION.
0 — 8.....	Hunting and Fishing.
8 — 26.....	Grazing and Forestry.
26 — 64.....	Beginnings of Agriculture.
64 — 192.....	Agriculture.
192 — 256.....	Beginnings of Industry.
256 — 381.....	Agriculture and Industry.
381 — 512.....	Industry predominates.
512 — 2,560.....	Industrial towns or suburbs.
2,560 — 5,120.....	Centers of small cities.
5,120 — 12,800.....	Centers of moderate cities.
12,800 — 25,600.....	Centers of large cities.

* Supan, "Bevölkerung der Erde," XII, 1904, p. 63. See, also, Gannett for Cuba, *Nat. Geog. Mag.*, Feb. 1909, p. 200. The same thing occurs also in Italy.

† "Eine Volksdichteschichtenkarte von Sachsen," Teubner, Leipzig, 1904, p. 169.

‡ The densities given in the table are supposed to be *uniform*. One cannot regard the United States as at the beginning of agriculture, for instance, because its *average* density is 28.

As the table, which is here given, in much simplified form, has been constructed from observed facts, its general indications are fairly sound. Of course, the precise placing of limiting values between neighbour occupations is arbitrary. Is it exactly at 192 people to the square mile that agriculture passes into industry? Can there not be manufacturing with a density of 191, or exclusive agriculture with 193? The scheme must not be applied so closely. And so with cities. It is plain that there is some density of population that is urban, though the assignment of any definite numerical limiting value is necessarily arbitrary. Nevertheless, it is thought useful to assume it at 10,000 people to the square mile—not far from the official average density of our American great cities. *A continuous area having everywhere 10,000 or more people to the square mile is a city.** If all the buildings of a city were dwellings and they were evenly distributed throughout the city, 10,000 to the mile would not occupy the ground very closely. It would correspond to blocks of four and three-quarter acres surrounded by a sixty-foot street, half the street width being counted to each block. The block would be subdivided into twenty house lots in two rows of ten, each lot measuring 50 by 150 feet, and each containing a house with four inhabitants. There might easily be twenty-five feet between houses and roomy front and back yards. In actuality, however, there is much inequality in the distribution of the inhabitants of a modern city. Necessarily, there are many other buildings than dwellings; factories, shops and warehouses, schools, places of amusement and government buildings, all of which will lessen the house space by large amounts. Railways, too, by their trackage take an enormous amount of space in the larger cities. Under the high prices that result from demands for land for these uses the house lots of the people diminish greatly in size, the yards nearly disappear and the number of inmates of each house becomes much larger. Reference has been made to Professor Penck's significant division of the useful areas of the world into "sustenance spaces" of the people and their "home spaces." The latter include a proportion of the not-dwelt-in areas of their neighbourhood. In large cities the home spaces are often too small to allow the inhabitants a wholesome supply of good air and the only check that public sentiment can oppose to this tendency is the introduction of parks and public gardens. A result is an increased mortality in some proportion as the city is larger and

* For distinction from the political city, this may be called the *anthropographic* one, or city according to the distribution of people, just as lines indicating grades of population-density may be called isanthropic lines and the maps isanthropic maps.

its population-density greater. Thus, in the European cities cited in Table I, densities and death rates are all high. It is not probable that the mortality statistics for European and American cities are comparable, the difficulty lying in the differences of date and different methods of compilation. Still, the accordance of mortalities and densities are too close to be casual. Densities are given here in people per square mile and mortality as deaths per thousand inhabitants. The close grading of mortality with density is striking:

TABLE IV.

CITY.	DENSITY.	MORTALITY.
Paris	88,000	23.8
Berlin	83,000	23.1
London	39,000	17.2
Vienna	25,000	21.5
New York	11,000	20.2
Philadelphia	11,000	18.8
Chicago	9,000	15.3

Cities are plainly unfavourable to long life and the greater the city the greater the danger. London has not long been an exception, and its present good condition is due to recent, definite effort. Chicago is the least "citified" of the world's great cities from the anthropographic point of view, and the safest to live in.*

The gradations of mortality within Chicago in 1900 are equally striking. Here are the figures grouped in four grades according to the density of population:

TABLE V.

GROUP.	WARDS WITH DENSITY OF	MORTALITY PER 1,000.
I	50,000 up	16.7
II	25,000 to 50,000	15.3
III	10,000 to 25,000	13.6
IV	under 10,000	11.8

The last group consists of the suburban wards.

Interesting, too, are the figures from New York. They appear

* The biennial *Report* of the Department of Health of Chicago for 1904–5, p. 190, claims that "here and there a population between 300 and 400 per acre, 192,000 to 256,000 per square mile, can be found." Such areas must be very small, but see below. Chicago's wards are so large that they allow considerable variations of density within them. Smaller subdivisions would undoubtedly give higher maximal densities. Thus in London the densest borough is Southwark, 1,132 acres of land, settled at the rate of 116,000 people to the square mile, but upon examining the registration districts, which are smaller, we find the much greater density shown in Table II.

to be prepared with unusual care. Individuals that enter hospitals and other "institutions" have their ward of residence noted in order that deaths which occur may be referred to the proper ward of origin.*

The following are the densities and mortalities of New York's five boroughs as reported by the Board of Health for the first quarter of 1908:

TABLE VI.

BOROUGH.	DENSITY.	MORTALITY PER 1,000.
Manhattan.....	97,000	19
Brooklyn.....	19,000	18
Bronx.....	4,000	17.4
Queens.....	1,200	16.7
Richmond.....	1,100	19†

Interesting light on the healthfulness of large cities is shown by studies in the meteorology of Berlin in the June *Meteorologische Zeitschrift* for 1909. Berlin finds that its growth into a great city causes even its house-tops to have less wind than the country around, and much less than used to blow in the smaller Berlin of twenty-five years ago. This is established by twenty years of recorded wind velocity on the tower of the Joachimsthaler Gymnasium, in the south-west part of the city. The instrument is about 134 feet above the ground and in 1884, when it was set up, there were no other buildings in the neighbourhood. Now there are houses all around and their roofs come within thirty feet of the level of the anemometer. The effect is just the same as if it had gradually sunk down from a height of 134 feet above the ground to within thirty feet of it. It is familiar knowledge that the winds everywhere blow faster above than near the obstructing surface of the earth, and so the record here shows slower and slower winds as the roof-level has crept up toward the instrument. In the successive pentads from 1884 to 1903 the wind had an average velocity of 12 miles per hour, 11 miles, 9 miles and 8 miles, a steady diminution to two-thirds of its former amount. This is as true for each single month as for the average of the whole year. In the main it must be a loss to the healthfulness of the city because of diminished ventilation and the diminution must be much greater down in the city streets.

* This is not done in Chicago and constitutes a defect in their mortality returns, for while the 1,510 deaths reported in Chicago institutions are added in when the city mortality is being computed, they are missing from their several wards of origin, nor is it likely that they have originated in equal proportions from all wards.

† Richmond has an abnormal number of residents above 60 years of age.

Storm winds, however, appear to be checked in much greater degree than lighter ones. Every month averages smaller values now for its strongest daily wind than in the earlier period and the decrease is greatest in the windiest months. From 1884 to 1893 the average velocity of the strongest daily wind of September was five and a half miles greater than from 1894 to 1903; of December ten miles greater. The strongest winds have diminished still more. In the first decade July had a maximum record of 35 miles per hour, which fell in the second decade to less than 30. But December, which had a maximum record between 1884 and 1893 of 47 miles per hour, only attained 30 in the ten years following. Down in the streets, storms are felt still less.

The checking of the wind is accompanied by a rise of temperature, the city being a degree and a half F. warmer in winter and two and a half in summer than the country about. Summer evenings in the dewless city often remain 7° F. warmer than the open country.* This higher temperature does not appear in earlier records made when Berlin was small.

The low population densities that characterize American cities are, in part, due to youth, in part to the inclusion of large suburban areas. The isanthropic map of St. Louis (Fig. 1) shows this well. The five outer wards are very large, covering in all some forty square miles of ground. The world-wide principle of small population where the political subdivisions are large would lead us to suspect them to be thinly settled. And so they are. The numbers on the wards are the densities per square mile with the last three figures omitted; thus 3 stands for 3,000 per square mile, 56 for 56,000 per square mile. As the outer wards do not reach the anthropographic limiting density of 10,000 to the mile, they have been left unshaded and should be classed as suburban, and their area and population subtracted from the figures of Table 1. This leaves a population of 452,000 on an area of twenty square miles, the shaded part of the map. The lightest shade on the map represents densities of population from 10,000 to 25,000 to the square mile, the next 25,000 to 50,000, and the darkest shade on this map over 50,000. It is, of course, quite unjustifiable, as any citizen of St. Louis will perceive, to subject the size of that city to an arbitrary reduction. No such reduction can be effected by any means. What is here proposed is to compare those portions of various cities that have more than a certain density of population. A city is "a close agglomeration of houses." The attempt is made in this paper to put a certain definite-

* *Meteorologische Zeitschrift*, 1908, p. 333.

ness on this closeness. But there is still an evident defect in the procedure. The northwestern large ward with a density of 3[000] to the mile, marches on the southeast with a ward with a density of 21[000]. Undoubtedly, the people are more closely settled in the

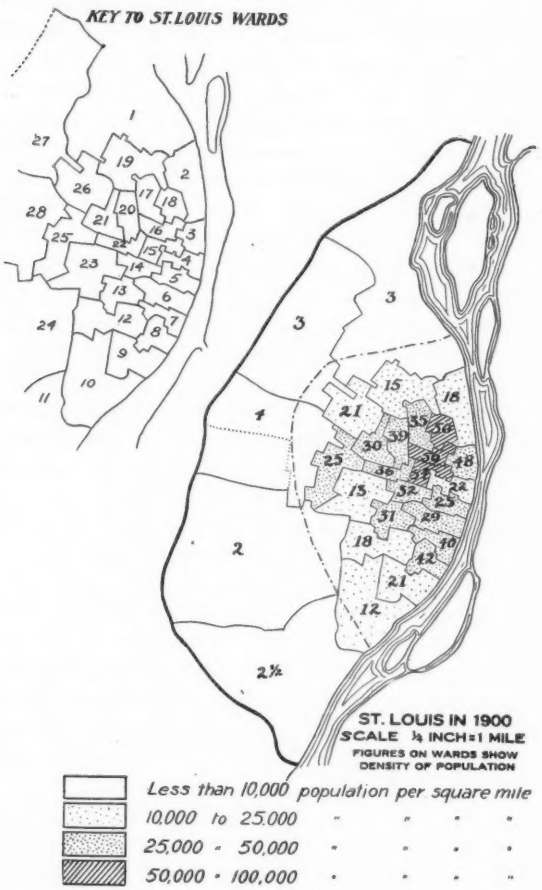


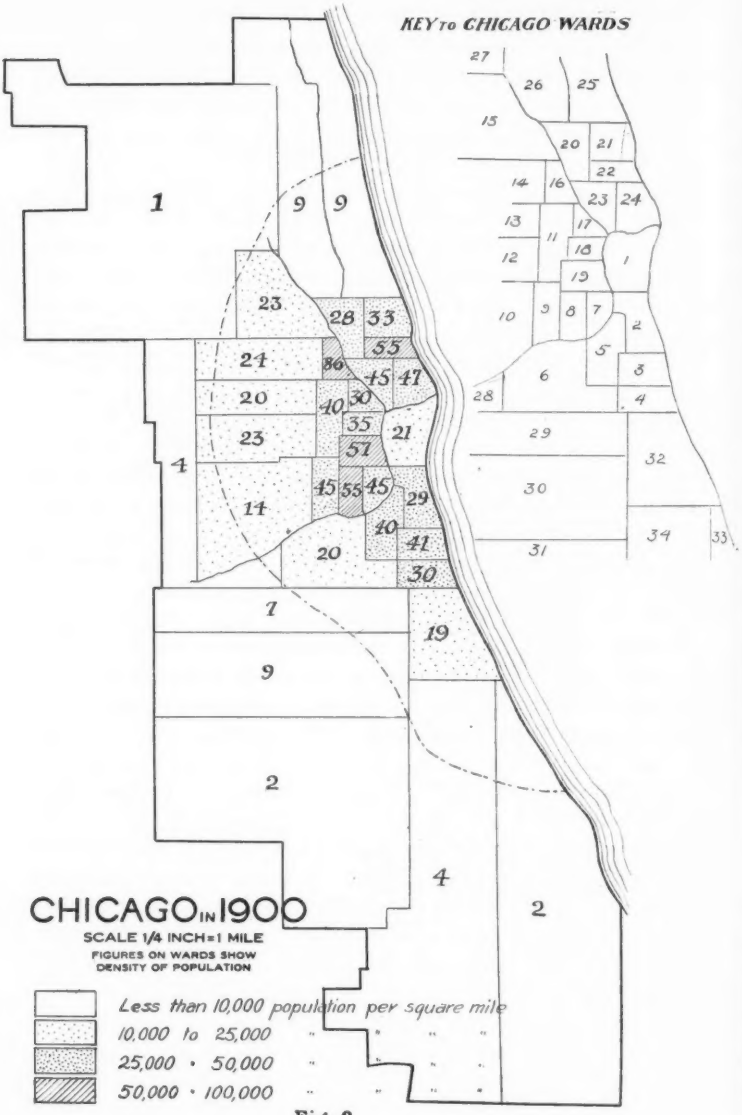
Fig. 1

southeastern part of Ward 27. This is shown, too, by the increasing density numbers in the successive wards to the southeast, culminating with 56,000 in Ward 16. The exact grade of 10,000 density should, therefore, fall somewhere between the centres of the two Wards, 27 and 26. If we locate it as we should an isotherm,

$\frac{10-3}{21-3}$ or $\frac{7}{18}$, the distance from the center of the outer ward toward that of the inner one, we find the sought-for isanthropic line passes through the larger ward. A portion of that ward, therefore, has "city" density, and the population and area of this portion should be added to the shaded area already counted. The same thing is true of all but the southernmost of the five outer wards. Such an isanthropic line has been drawn with dot and dash on the map, and from its study it appears that nearly 50,000 people on four square miles should be included in the anthropographic city. Anthropographically, St. Louis had, in 1900, 500,000 people living on 24 square miles of land with a mean population density of nearly 21,000 to the mile.

The lighter shade on the river bank—Ward 4—is the business center, excentrically placed, as in so many American cities, where the life-giving river is used as a boundary and not as the artery it would be in the Old World. The thinness of population within a denser ring here is characteristic of all great cities. Here public buildings, shops and hotels have crowded dwellings away to cheaper land. As the city grows larger this process will go still further, the central district actually losing inhabitants. The darkest shade of the map indicates the city slums, between Pine and Herbert Streets and 11th and 22nd, in Wards 15, 16 and 18, where the dwelling is the tenement house. Beyond are residential wards of better houses with larger yards, coincident with the lightening shades of the map.

Chicago is much similar to St. Louis in its anthropography, although so much larger. The scale of the drawing (Fig. 2) is the same and the grades of density the same. Again we see the thin core of the business center, Ward 1, with sky scrapers, public buildings, the great hotels and the costliest land in the city. It will be recalled that the greatest mortality in the city was in the wards of over 50,000 people to the square mile. It is now seen that these lie along the two branches of the Chicago River. The whole strip along the west side of these waterways has since been united for sanitary reports into the fifth sanitary division. "The population of the division as a whole is mainly of the poorest classes, with a large foreign element and a relatively large child population. The sanitary conditions are extremely unfavourable. The dwellings are old, largely of wooden construction and usually overcrowded. Factories, lumber yards, storage warehouses, grain elevators, railway freight yards, etc., occupy the river front. The increasing number of factories is


KEY to CHICAGO WARDS
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CHICAGO IN 1900
SCALE 1/4 INCH=1 MILE
FIGURES ON WARDS SHOW DENSITY OF POPULATION
Less than 10,000 population per square mile
10,000 to 25,000 " " " "
25,000 · 50,000 " " " "
50,000 · 100,000 " " " "

Fig. 2

gradually driving the population westward."* Mr. Ralph Blount writes:

"The poor people live in the river wards because it is within walking distance of much work. Land there is expensive and flats are not cheap, but the people crowd together and so meet the expense. The heavy belt would reach all round the core, to the lake, if the best places along the lake were not taken by the wealthy. Ward 24 (now 21) just north of the mouth of the Chicago River, is especially a residence for nabobs. In the river wards the houses are miserable. Many of them are old wooden structures, moved in from places where new buildings have been put up. The back yard is commonly occupied by a rear tenement, leaving no open ground. No wooden buildings are permitted to be built except in the outlying parts of the city, but thousands of old structures are allowed to stand and even to be moved from one lot to another. On oppressive evenings of the warm weather one may pass along Halstead Street and seem to find the whole population out of doors. Women and children, very scantily dressed, may be seen at all hours of the night, sitting asleep on the steps. In this region is much sidewalk vending."

The thinning of the ring of heaviest population west of the junction of the branches of the Chicago River is accounted for by the Union depôt and many tracks from the south and west. The entire northern part of the area is taken up by railroad tracks. It contains a very large number of small factories, stables, offices, stores and amusement places and Union Park.

The large outer wards are thinly settled, if less so than at St. Louis. There are 123 square miles of these suburban wards, averaging under a density of 10,000. The shaded portion of Chicago contains 1,287,000 people on 57 square miles. Sketching in the isanthropic line as at St. Louis, another 15 square miles with 200,000 people living under "city" conditions are found to be added to the inner part. An anthropographic city of 1,500,000 people on 72 square miles of ground results. The mean population density is near 21,000.

The people of Philadelphia are grouped in their city in very similar fashion (Fig. 3). The thinly settled core of the business center is the Ninth Ward, elongated east and west, as it contains the district between Chestnut and Market Streets, both running east. Here are the city hall, post office, two great railway stations and the

* Biennial *Report* of the Department of Health, City of Chicago, 1904–5, p. 253.

finest stores and office buildings in the city. The population is but 17,000 to the square mile. About this is the usual denser ring, considerably denser than at Chicago and over a greater area. So a

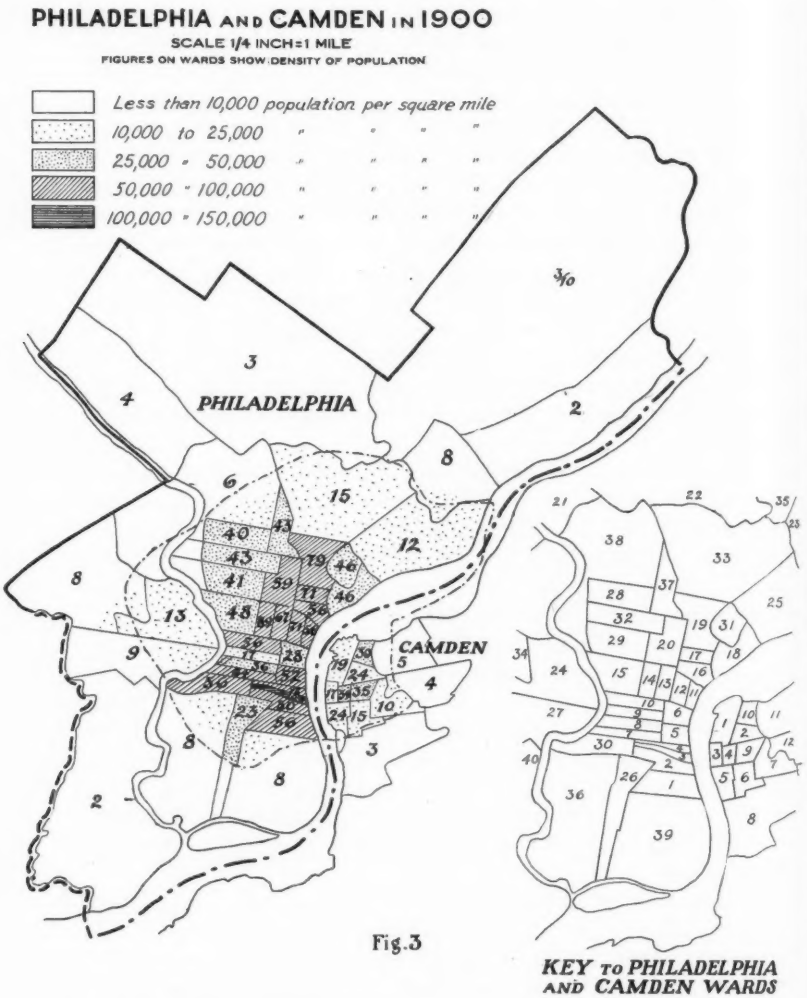

Fig.3

new shade appears on the map for a density above 100,000 to the mile. This is found in the Third Ward along Catherine, German and Christian Streets. The two- and three-story houses, especially

at the east end of the ward, are closely inhabited by a foreign population which fills the streets even in winter, so that passing is difficult. On the shops foreign signs predominate, many of them Italian, many of them Hebrew. The sidewalks are much encumbered by stalls, tended often by the women while the men gather and transact business in the street. Beyond the denser ring comes the usual

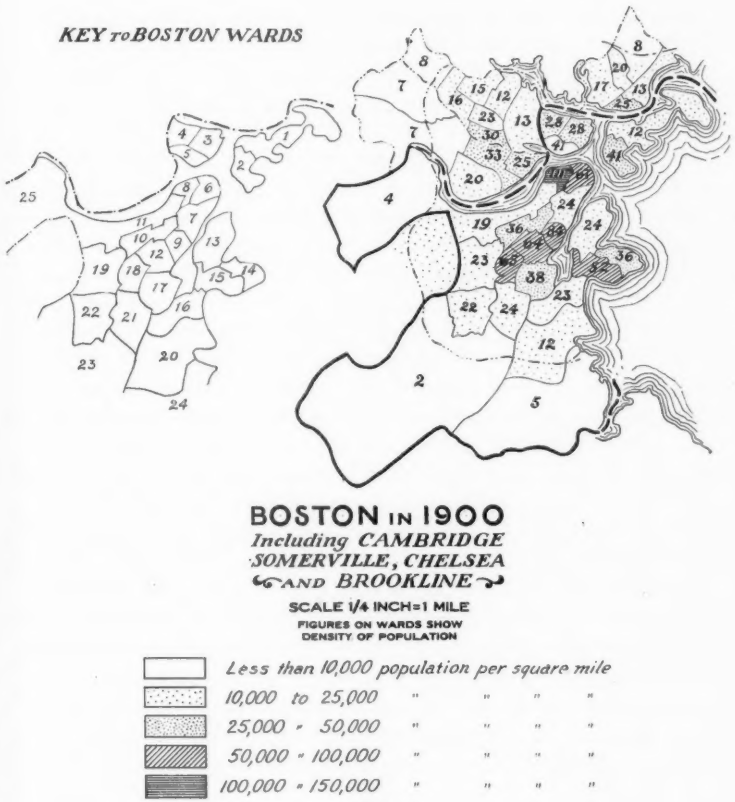

Fig. 4

thinner district of better homes, and beyond this the suburbs of enormous extent within the political limits of the city, just as in Chicago and St. Louis.

The influence of ocean-borne commerce in the Delaware is sufficient to lead to considerable settling of the New Jersey shore.

Though the river is the political east boundary of both Philadelphia and its State, Camden shares in its commercial and industrial life and has a considerable area belonging to the anthropographic city. The line of 10,000 density has been drawn on the map as usual. Within it Philadelphia has about 34½ square miles and 1,073,000 people. Camden, politically mistress of 7 square miles and 76,000 people, has an anthropographic 3.3 miles and 69,000 people. The two together make up an anthropographic Philadelphia of 38 square miles and 1,142,000 people—30,000 to the square mile.

Boston (Fig. 4), like Philadelphia, needs the 100,000 shade for one ward, the 8th, in the North End. But the density in portions of this ward must be very much greater, for it includes the state house and grounds, the Charles Street jail, the Massachusetts General Hospital, as well as the North Union station and no little trackage on the east, and the Charlesbank open air gymnasium on the west. The ward includes all the space between the river and Cambridge, Chardon, Traverse and Charlestown Streets, as well as a strip from the Common northward between Joy and Bowdoin. The business center falls in Ward 7 (see key to numbers of the central wards) where the density is 24,000 to the mile. It is less well surrounded by a denser ring on account of the irregular mingling of land and water in Boston, and also on account of the presence of the Common in the west end of the ward, which brings the residential quarter on Commonwealth Avenue in Ward 11 close to the business center. As the Charles is not a State boundary, Boston has grown across the river by incorporating old Charlestown and East Boston, just as European capitals sit astride their streams. Anthropographically, the incorporation must go still further and take in also Cambridge, Somerville, Chelsea and Brookline. The isanthropic line has been drawn and the official and anthropographic figures for the area in whole and part follow:

TABLE VII.

GREATER BOSTON IN 1900.

	OFFICIAL.		ANTHROPOGRAPHIC.	
	AREA, SQ. MILES.	POPULATION.	AREA.	POPULATION.
Boston proper	38.5	561,000	18	501,000
Cambridge	6.5	92,000	4	78,000
Somerville	4.2	62,000	3	56,000
Brookline	2	20,000	1	15,000
Chelsea	2	33,000	1	31,000
Greater Boston	53.2	768,000	27	681,000

The density of population becomes 21,500 to the square mile and the city fourth in size in the United States.

The reader who has gone so far in this paper may, perhaps, be disturbed by its style of arithmetic. The figures dealt in here are very "round," as if fifty or a hundred thousand inhabitants more or less did not much matter. That, of course, should not be said; but it is a plain matter of fact that we do not know our million-cities within anything like a hundred thousand of the actual number. Let us not delude ourselves in this matter; quite apart from the problem presented above "What is a city?", involving the attempt at standardizing the concept which is here being made, the figures that censuses give us must be scrutinized after all the conscience and intelligence that the census taker has put into them. There is such a thing as a fictitious accuracy that would carry significant figures to units or even fractions without being critical of the correctness of the figures in the hundred thousands place. This is so prevalent in geographical works to-day and so serious, that an example is here introduced. An American publishing house gives the area of North America as 8,035,632 square miles, seeming to know it to the mile, yet that quantity has a palpable mistake of 2,440 miles, introduced, not by the printer, but by the compiler of the figures! There is interest in examining the case. The figures are stated to be "from Supan's Bevölkerung der Erde." Supan, of course, gives square kilometers, and for each omits the units and tens, leaves them ciphers, meaning, of course, that we have not knowledge of the areas in question to anything like that degree of accuracy. By comparing the American figures in question with Supan's, it is seen that the reduction has been made in each case by multiplying by the factor 0.386. As this is precise in each case, it is no misprint that is involved. Thus from Supan's 20,817,700 square kilometers have been derived the figures above. But one square kilometer equals 0.3861161 square miles, and in dealing with millions those last four figures are important, for the use of the full factor makes the area 8,038,072 square miles, which is greater than the figure given by the publishers by 2,440 square miles. And so all the other continents. The figures they give have a fictitious appearance of accuracy. The present writer does not believe the area of even Europe is known within ten thousand square miles.

All figures are liable to errors, and no user of them is safe who does not have some idea of the magnitude of these errors. The director of the census estimates that any census should be accurate

within one per cent.* This would mean that Boston's population, reported as 560,892, is probably within 5,609 of that number, or between 555,283 and 566,501. About 561,000 is not an inaccurate statement of it, therefore, there being some doubt about the tens of thousands. Furthermore, city populations are actively growing, even in countries with stationary total population, like France. It is without meaning to state the population of a big city without giving a date. Thus, if we adopt the close formula for the growth of Greater Boston by Mr. Frederic H. Fay,† and modify it to the case of the slightly larger anthropographic city, the number of thousands to be added in each year after 1900 will be successively 15, 30, 45, 61, 76, 91, 108, 123, 139 and 155. In this year 1909, therefore, it is 820,000; in the new census year where it may soon be tested, 836,000. With the hundreds and probably thousands figures in doubt and some fifteen thousand a year of increase, is it worth while to cite significant figures in the last two places? Where such work as Mr. Fay's has been done, it would be best to state the city size as 681,000 in 1900 with 15,000 growth a year. As for the method of drawing the isanthropic line of 10,000, it is a makeshift, perhaps the best thing that can be done to remedy the existing lack of uniformity in the meaning given to the name "city." The census taker or the local official who assembles the data could do this thing far better at the time of the census than anyone can ever do it afterward. It is believed, on much study of the whole matter, that our present result for Boston should not be 50,000 in error, perhaps more for larger cities. Even thus the city figures become far more accordant, more fit for comparisons, than anything now extant.

New York (Fig. 5), of course, has anthropographic interest for us in greater degree than other cities. The absoluteness with which the island of Manhattan is limited geographically has caused a phenomenal condensation here. If the tunnels recently opened west and east are to destroy this limitation, material redistribution of people can hardly come in time to show before the census of 1920. Two new shadings for density have now to be introduced, one for 150,000 to the square mile, which we shall see used again in Europe, and the deepest of all, which appears in Manhattan only, that for 300,000. Here, again, the State as well as the political city is bounded by the Hudson. Where only the East River bounded the city, it has grown across into Brooklyn as also into Staten Island (Richmond borough) across the Hudson, where the State boundary also swerves away from that

* "Census Bulletin," 149, Washington, 1902, p. 15.

† "Population and Finances of Boston," Boston, 1901, p. 9.

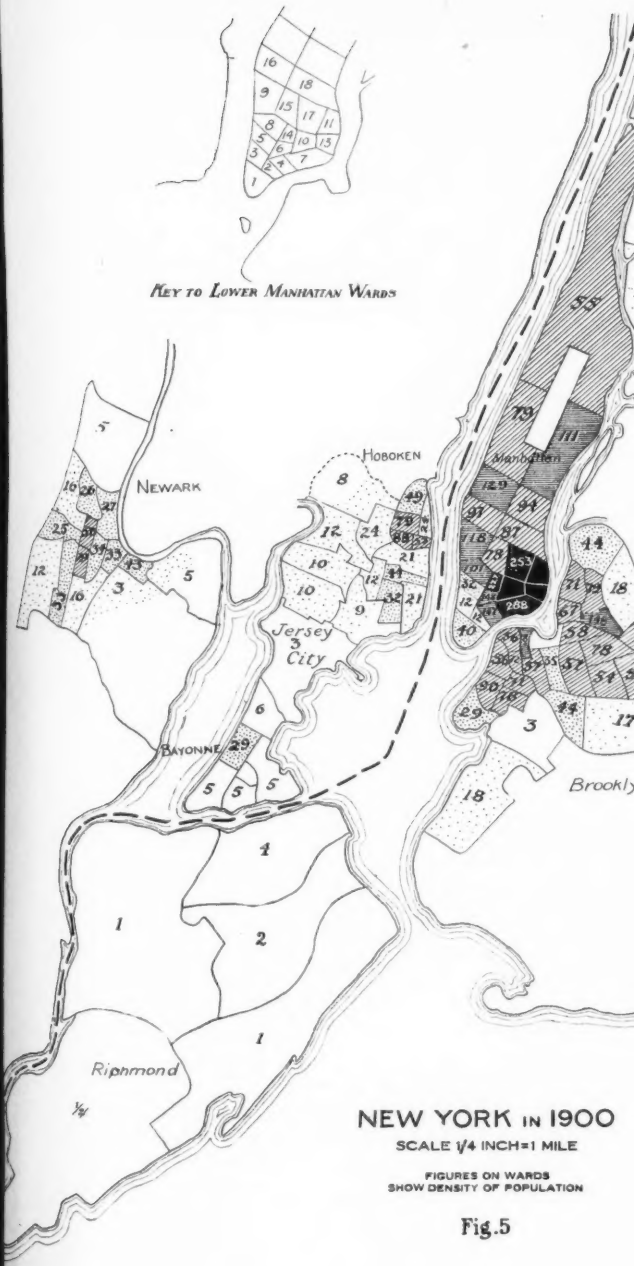
KEY TO LOWER MANHATTAN WARDS
NEWARK
HOBOKEN
Manhattan
Jersey City
BAYONNE
Brookly
Richmond
NEW YORK IN 1900
SCALE 1/4 INCH=1 MILE
FIGURES ON WARDS
SHOW DENSITY OF POPULATION

Fig.5

Less than 10,000 population per square mile
10,000 to 25,000 " " " "
25,000 " 50,000 " " " "
50,000 " 100,000 " " " "
100,000 " 150,000 " " " "
150,000 " 200,000 " " " "
200,000 " 300,000 " " " "
over 300,000 " " " "

N 1900
1 MILE
RDS
ULATION

river to the westward. It is certain that only the State boundary prevents the inclusion of Hoboken and Jersey City. Anthropographically and, indeed, commercially they are a part of the city to-day. On four successive voyages out of New York the writer has sailed from Brooklyn, Jersey City, New York proper and Hoboken. Bayonne is not a part of it, for the diagram shows plain suburbs between it and Jersey City, so that it is not continuous with the urban population. Newark might seem to be in some doubt. It is here included, on the ground that there is only water and tidal flats between it and the rest of the city, and water must be recognized to connect rather than separate. Readers will hardly need reminding that most of the Jersey shore opposite Manhattan island is occupied by the steep bluffs of the Palisades. Figure 5 displays all this as well as the enormous open spaces of Queens, Brooklyn and Richmond boroughs. It is not at all probable that the parts of Queens that march with Brooklyn are purely suburban as here represented, but the data of nine years ago are regarded as so ancient in all great American cities that the ascertaining of the ward boundaries of 1900 has been the work of much labour, and especially so in New York. In Queens they could not be ascertained. The five wards have densities of 7,000, 1,800, 800, 500 and 1,200 respectively. Twenty thousand, about half the population of the densest one, have been added as suburban. The results of the discussion of details give us for New York in 1900:

TABLE VIII.

	OFFICIAL.		ANTHROPOGRAPHIC.	
	AREA. SQ. MILES.	POPULATION.	AREA.	POPULATION.
New York	307.7	3,437,202	50	3,150,000
Jersey City	18.25	219,462	11	198,000
Hoboken	1.22	59,364	1.22	59,000
Newark	15.50	246,070	10	229,000
	342.67	3,962,098	72.22	3,636,000

From census estimates in 1906 it appears likely that this anthropographic city is growing 120,000 a year. By 1909 it would have come to be a city of nearly 4,750,000. Wards 10, 13, and 11 in the lower city, have respectively 418,200, 383,500 and 323,700 people to the square mile, the greatest density known in the world. "The people are largely Russian Jews, living at times 300 to a building in

old, three- to seven-story houses, though there are some new six-story flats with very small rooms where five families live on a floor. It is a sight worth seeing to watch the people in the street on a good day, absolutely filling it. One must walk in the middle of the street to avoid the children. A large part of these people are tailors and desperately enterprising. Ward 13 was lately Irish and American, but the Jews are driving them out.*

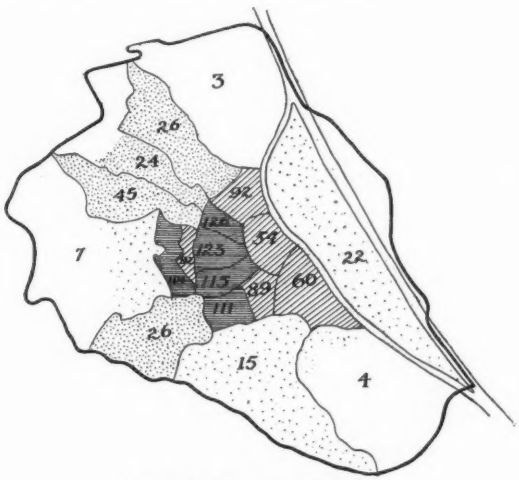

Fig.6

The business center, toward the southern tip of the island, is easily made out by its greatly lessened density of population, falling almost below "city" grade in Wards two and three, at 12,000 to the mile. Here are the famous skyscrapers, office and newspaper buildings, which extend northeastward along Broadway. There are few dwellings in this part of the city, most of the old buildings being used for wholesale or commission business, warehouses or factories.

* Communicated by Dr. Ellsworth Huntington, as reported by a New York police sergeant.

The shape of the island affords little opportunity for a surrounding ring of denser population. The Americans have in great part moved to Brooklyn, with the multiplication of Jews and Italians.

Vienna is the only one of West Europe's great cities with open spaces within its political limits, such as we have found characteristic in America. This has been true only since 1890, when the outer suburbs were annexed, with a good deal of unoccupied land between them as they radiated away along the western highways of approach. As the ground on this side is very rugged, Vienna now has a mountain within its walls where the citizens may shoot without having to pay the old-time game tax at the gate.* Figure 6 shows the city densities, data being taken from "Statistisches Jahrbuch der Stadt Wien, 1903," p. 53. As with Chicago and St. Louis, the center, Innere Stadt, with 54,000 to the square mile, is excentrically situated on the bank of the Donau canal, with a denser ring about. Mariahilf and Neubau, recognizable on our map by the density numbers 115[000] and 123[000], have most of the city's factories. Beyond this district population falls off to the outer limits.

The one-sided position of Vienna on the right, high bank of the canal is well described by Gulliver.† It is the more striking since other European cities tend to a circular arrangement and occupy both banks of their streams. It especially resembles St. Louis in this general arrangement, for east St. Louis is as much hindered in its growth by the lowness of the east shore and its liability to flood as by the geographic unwisdom of using a river for a boundary.

The population adjoining the outer suburban districts is so dense that we must suppose their nearer portions at least are also within the isanthropic line of 10,000, so rather more than a third of the population of these suburban districts has been added to the population within. Vienna's anthropographic population is about 1,600,000 for 1900 on an area of 48 square miles.

In Berlin (Fig. 7) we come to a type of city that has no open spaces within except those that have been set aside as parks to remain open and keep the city beautiful and wholesome. These cities have expanded against the restraining influence of city walls and at times against distinct statutory attempts to limit the city growth.‡ Again and again they have broken through these restraints, and to-day we find them grown quite beyond their legal and corpo-

* Oral communication of Professor Penck.

† "Vienna as a Type City," *Journal of School Geography*, 1900, p. 176.

‡ In the case of London.

rate limits. The contrast here to the American cities that seem to set out a limit to which they hope soon to grow is not a result of the great rapidity with which our towns grow, for Berlin's growth is quite as prodigious, but is rather a result of the long history and old fixed institutions of Europe.

Fig. 7 shows this contrast well. The open space at the west end of the city is the Thiergarten. It might properly be divided among the adjacent city districts to find correct areas for computing density of population, since it does make the population less dense in effect.

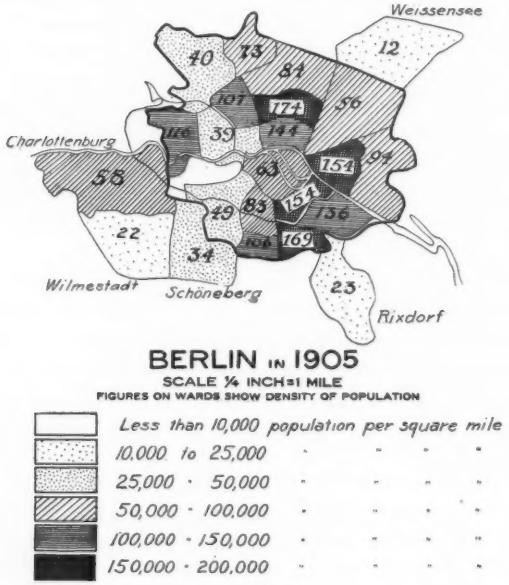

Fig. 7

As it does not happen that this would change any of the shades adopted on our map to show grades of density, it has not been done.

There is the usual thin core of the monumental and business part of the city, here centrally placed within successive denser rings. Between 1895 and 1905 the inner parts of the city, the districts numbered for density on Fig. 7, 154, 174, 144, 63, 154, 169, 49 and 39, have all lost population, both in density and total numbers. This has been attributed to the recent development of electric railways, but is better referred to the pressure of the growing city mass towards its central part. The bigger the city the higher the rent in

the central parts, expressed here in sums far above any possible return from use for dwellings, but appropriate to enlarged business opportunities. This elevated rent is entirely adequate to drive dwellings out of the central region. People do not go away because a convenient means of transportation is provided, unless some force or attraction starts them. Transportation facilities rather work indirectly by giving attractiveness to regions formerly not usable. They must rather increase the total area of the anthropographic city toward its outer thinner margin than diminish the inner density.

The dense ring about Berlin's center would doubtless be uninterrupted if we had the data for some smaller unit of subdivision than the Standesamtbezirk. The outlines of these are not here drawn with precision, but are constructed from the street map of the city and the district lines as given in the Brockhaus *Lexikon,* a little vague in places.

The bursting out of the population beyond the city limits is manifest in the partial ring of cities without that belong to Berlin's population-mass, Charlottenburg, Deutsch Wilmerstadt, Schöneberg, Rixdorf and Weissensee. They are far above the urban type in density and continuous with the city. Charlottenburg has a density of population greater than any part of St. Louis, and a third of a million people. It should be included in the anthropographic city and not as suburbs, for life there is urban entirely. The addition of these districts is as necessary to get a sound concept of the city there as exclusion of thinly settled regions within Chicago or Vienna. This urban character is of doubtful advantage to Charlottenburg. On a good many grounds the superiority of the country over the city to live in is manifest. Our brief consideration of mortality rates will serve as an example of this superiority. In the present study, considerations of a civic pride that makes one glad to hear how big his own city is have no place. We are looking for a well-founded distinction between urban and suburban groups of habitations.

Our result in this case is an anthropographic Berlin, in 1905, of 2,584,000 people on 44 square miles. It is very likely that there are small extensions of continuous population other than those here noted, but it is not believed that they would cause a considerable increase in the numbers.

Paris (Fig. 8) is even more compactly crowded within its civil limits than Berlin. The Arrondissements are consecutively numbered in a spiral, beginning near the center with the one whose density is given in Fig. 8 as 86[000] to the square mile, and going around continuously to the right to terminate with the 20th, numbered

81[000]. The "Louvre," 1st arrondissement, is thinned by public gardens and edifices, while the 3rd, just east of it, has few monuments and is closely packed with dwellings. It is a part of the usual denser outer ring. The uniform prevalence of a high degree of density in Paris is striking. It will be remembered that this has been a million-city since 1850. There is a relation between the two facts, especially as fortifications and city walls were formerly more significant than to-day. The empty space on the west is the Bois de Boulogne. Almost on every hand the population has burst out

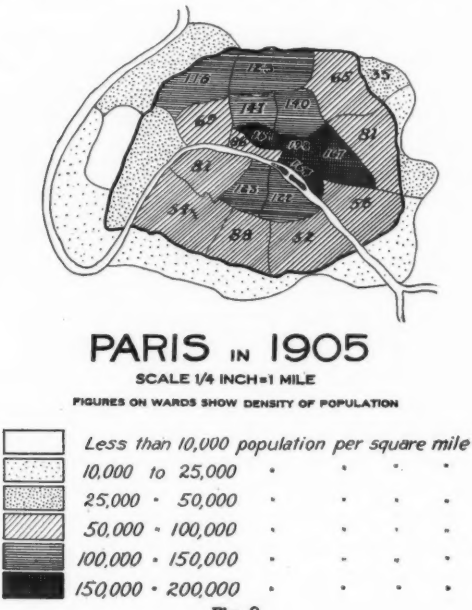

Fig. 8

beyond the limits in a ring of population politically suburban, but anthropographically of city character. There are appearances of city districts on the north, but the amount would not perhaps be large. The result obtained for 1896 was 2,874,000 people on 44 square miles, those for the outer districts for 1901 not being at hand.

For London, the only century-old city of a million inhabitants, fortified by the seas around its island, a full study is made possible by the admirable British census volumes, in which are given the areas and maps of all enumerated districts. The registration dis-

tricts have been used as units and they are small enough fairly to represent the gradations of the actual peopling. The city is very symmetrically arranged about the Thames, which constitutes its port,

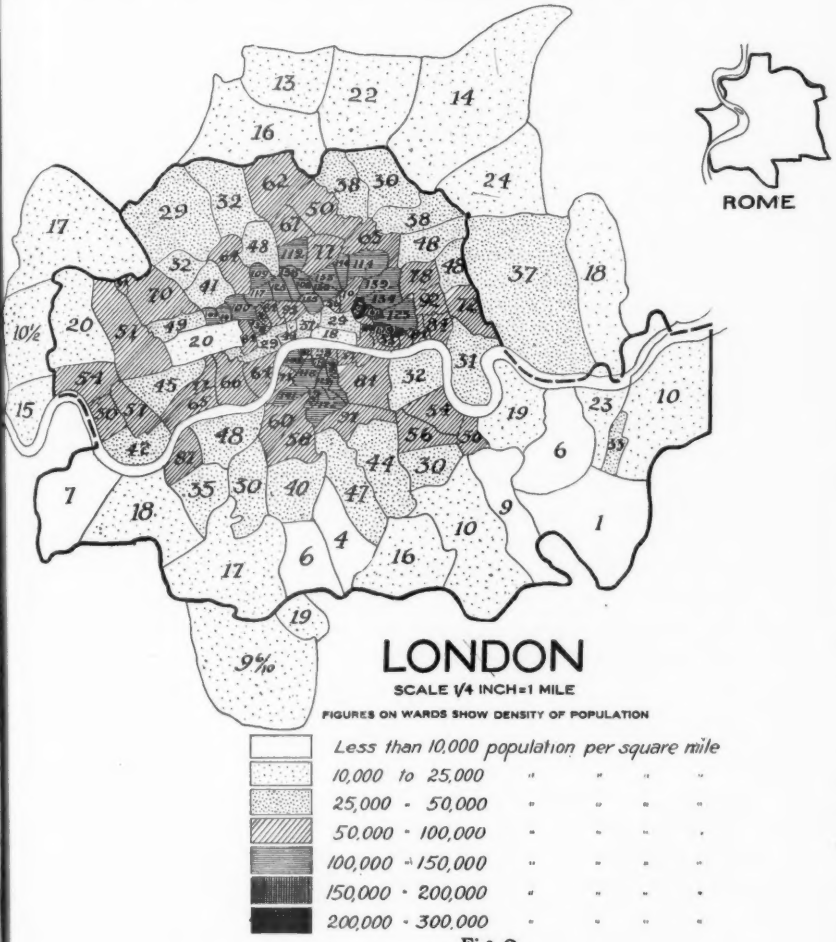

Fig. 9

the greatest port in the world. Fairly in the center of the whole are the three districts of London City, All Hallows Barking, St. Botolph and St. Sepulchre, with 18,000, 29,000 and 37,000 people to the square mile, appropriate to the heart of the city. In any direction

but west one may go off four or even five miles across the denser rings before districts so thinly settled will be encountered. Only in the direction of the appropriately named Westminster is a line of continuous thin settlement into the aristocratic West End, through the Strand, Martin's in the Fields and Mayfair and Knights with but 20,000, as its area is largely taken up by Hyde Park and Kensington Gardens. This strip contains a good part of London's show places. But close at hand in the opposite direction is the East London that Besant describes as a city of 2,000,000 without hotel, restaurant, bookshop or newspaper. Densest in Stepney are Spitalfields, Mile End New Town and St. George North, all with over 150,000. Thence again a mile-broad band with more than 100,000 springs around through the northwestward to Hyde Park. How familiar they sound, these district names in London's denser band: Bethnal Green, Haggerstown, Hoxtons, City Road, Goswell Street, Clerkenwell, Somerstown, Gray's Inn Lane, Tottenham Court, St. Anne Soho, All Souls, Rectory and St. Mary in Marylebone! Across the river from the City, too, the density at the shore is low in St. Saviour's and St. Olave, Southwark, 58,000 and 51,000 to the mile, but at once rises to 174,000 in Borough Road, while a considerable area of 100,000 stretches to Camberwell and into Lambeth. Thence the population thins again.

Barely three square miles of the city's center seem to feel the pressure from without that thins, but the city's "urban" population bursts beyond the County limits into Essex, Middlesex and Surrey. The heavy line on Figure 9 bounds the county of London. Beyond this have been included all districts in the surrounding counties that have a population density above 10,000 to the square mile continuous with such a population within. There can be little to add here, to subtract nothing. This city, the anthropographic London, contained, in 1901, 5,327,000 people on 139 square miles of territory and was growing at the rate of about 65,000 per year. Not merely is the City diminishing, but the central fifth of the whole area shows a loss of inhabitants in the decade preceding 1901, shops, public and office buildings steadily taking the place of dwellings.

On the border of the map of London has been placed the outline of old Rome of the Aurelian Wall. There is nothing inferred in either diagram. Both represent matters of fact and measurement. The reader may fill in the density shade of Rome to suit himself and add suburbs as he likes. The scale of all the drawings is the same.

Something has been said above about the rate of increase of

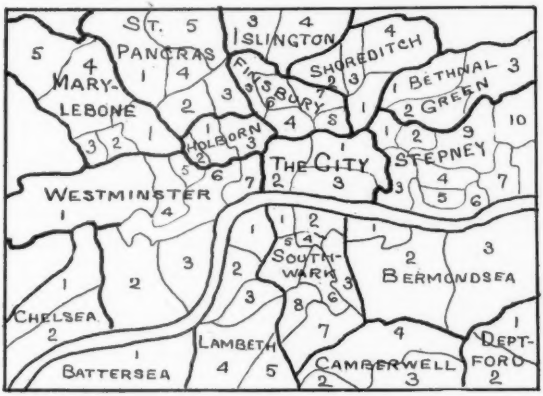

FIG. 10.—REGISTRATION DISTRICTS, CENTRAL LONDON.

Marylebone
1 All Souls
2 Rectory
3 St. Mary
4 Christchurch
5 St. John

St. Pancras
1 Regent's Park
2 Tottenham Court
3 Gray's Inn Lane
4 Somerstown
5 Camden Town

Islington
3 Barnsbury
4 Islington S. E.

Shoreditch
1 Shoreditch South
2 Hoxton New Town
3 Hoxton Old Town
4 Haggerstown

Finsbury
4 St. James Clerkenwell
5 Amwell
6 Goswell St.
7 City Road
8 Finsbury

Bethnal Green
1 B. G. North
2 " South
3 " East

Westminster
1 Mayfair & Knights
2 Belgrave
3 St. Margaret & St. John
4 St. James, Westminster
5 St. Anne, Soho
6 St. Martin in the Fields
7 Strand

Holborn
1 Bloomsbury St. Giles, S.
2 St. Giles, N.
3 Holborn

The City
1 St. Botolph
2 St. Sepulchre
3 All Hallows, Barking

Stepney
1 Spitalfields
2 Mile End New Town
3 Goodmans Fields
4 St. George, N.
5 St. John
6 Shadwell
7 Ratcliff
9 Mile End Old Town West
10 " " " " East

Chelsea
1 North Chelsea
2 South "

Lambeth
1 Waterloo Road
2 Lambeth Church 1st
3 " " 2nd
4 Kennington 1st
5 " 2nd

Battersea
E. Battersea

Camberwell
2 Camberwell
3 Peckham
4 St. George

Southwark
1 Christchurch Southwark
2 St. Saviour Southwark
3 Kent Road
4 Borough Road
5 London Road
6 Trinity Newington
7 St. Peter, Walworth
8 St. Mary, Newington

Bermondsea
1 St. Olave, Southwark
2 Bermondsey
3 Rotherhithe

Deptford
1 Deptford North
2 " Central

some of the cities studied. As official estimates of population of all of them have been made about 1906 or 1907, I have used the ratio between the earlier and later figures and that between the official and the anthropographic numbers to estimate an approximate rate of

increase. The results and estimates for the date 1905 are appended here.

TABLE IX.

	Anthropographic Cities.				
CITY.	AREA, MILES.	POPULATION.	ANNUAL INCREASE.	POPULATION 1905.	PER SQ. MILE.
London.....	1901...139	5,327,000	65,000	5,581,000	40,000
New York...	1900... 72	3,636,000	119,200	4,232,000	59,000
Paris.....	1896... 44	2,874,000	33,000	3,173,000	72,000
Berlin.....	1905... 44	.....	27,700	2,584,000	59,000
Vienna.....	1900... 48	1,600,000	35,000	1,775,000	37,000
Chicago.....	1900... 72	1,500,000	51,700	1,758,000	24,000
Philadelphia.	1900... 38	1,142,000	26,200	1,273,000	33,500
Boston.....	1900... 27	681,000	15,000	756,000	28,000
St. Louis...	1900... 24	575,000	10,700	554,000	23,000

The method of estimating the annual increase is very crude, yet the writer believes it is within one or two thousand of the truth. If the values were projected forward to 1910 we should get so far away from our base of facts that they would merit much less confidence. The above values are presented as the first series of comparable ones worked out. The singularly rapid growth of New York is apparent at once. If the rates remained constant it would have the same population as London in 1930.

BERNHARD HANTZSCH'S NOTES ON NORTHEASTERN LABRADOR.*

BY

ROBERT STEIN.

Works that give a clear picture of the face which nature wears in Arctic lands and seas are none too numerous, and hence are hailed with special satisfaction. When informed that on one of the Peary expeditions over 400 musk oxen were shot, most people ask in astonishment: What do these animals feed on? It takes some time to make them understand that the total of 400 was made up of small herds distributed over a country as large as Ireland. But what do they live on during the winter, when the snow covers everything? Great is the average reader's astonishment on learning that, on

* Beiträge zur Kenntniss des nordöstlichsten Labradors. Von Bernhard Hantzsch. *Mitteilungen des Vereins für Erdkunde zu Dresden.* Heft 8. Dresden, 1909. Pages 169–229.

Arctic lands free from inland ice, the cover of snow never remains unbroken more than a few days, but is likely to be blown away from level surfaces by the first wind, leaving the vegetation far more accessible than in many a temperate land.

The reader who rises from perusal of the paper described in the title will give emphatic assent to Hantzsch's modest hope that it may be "worth publishing." Not many corners in Northeast America have been so fully portrayed in 61 pages as the terminal point of the northeastern peninsula of Labrador, which was the scene of his explorations. Primarily undertaken as an experimental trip preliminary to the ornithological exploration of Baffinland, the voyage added interesting data to our knowledge of the geography, geology, zoology, botany and ethnology of northeastern Labrador.*

The north coast of Labrador, forming the south shore of Hudson Strait, is divided by Ungava Bay into two peninsulas, a broad western and a narrow, triangular eastern one, terminating in Cape Chidley, which forms the southern gatepost of the mouth of Hudson Strait, the northern gatepost being formed by Resolution Island. Cape Chidley, however, is not really the terminal point of the Labrador mainland, but is situated on an island as yet nameless, roughly 20 miles square, separated from the mainland by a strait, 25 miles long and for the most part about a quarter of a mile wide, and running almost due east and west, called MacLelan Strait. On A. P. Low's map in "The Cruise of the Neptune," a second strait is marked with dotted lines a little farther south, but Hantzsch says that no such strait exists. At the western end of MacLelan Strait, and on its north side, in a bay called Port Burwell, is situated the mission station of Killinek, which the author had selected for his headquarters. Emerging from the fog of the Labrador coast, the mission ship "Harmony" from London, on which he had taken passage, found itself on July 24, 1906, off the east end of Resolution Island. The entire north side of Hudson Strait was open, with numerous icebergs, but very little sea ice, the latter having been crowded southward, where it formed what seemed an impenetrable belt, barring the approach to the north coast of Labrador. On the north side of the strait the drift of the ice was inward, toward Hudson Bay; on the south side outward, toward the Atlantic. Eleven days were spent in steaming to and fro in the hope of discovering an open lane of water leading southward through the belt of ice. At last, on August 4, the ice having shown signs of loosening, the ship,

*The conclusion of Mr. Hantzsch's paper appears in the same publication, No. 9, and is devoted to the Eskimos living in the region he explored.

after five hours of fierce struggle, emerged into open water along the south shore and cast anchor in Port Burwell. On August 5 the party landed and Hantzsch took up his abode at the mission station of Killinek. On August 22 the steamer started homeward, leaving him and the missionaries to their own resources.

Killinek station seems destined to become a central point for the whole vicinity. Established in 1885 as an observation station, it soon attracted a number of natives. Since the beginning of the nineties, the firm of Job Brothers, of St. John's, Newfoundland, have sent, every year, a steamer to those waters, mainly for the codfish business. In 1898 that firm erected four small wooden dwellings. The missionaries of the Moravian Brothers of Labrador thereupon began to visit the station. In 1904 the property was sold by Job Brothers to the London Society for the Furtherance of the Gospel. More Eskimo families took up their abode near by, and erected three houses, till in the winter of 1906-7 the number of natives rose to 105. The white man's presence here, as in Greenland, causes a greater concentration of the native population, the outlying settlements being even abandoned. From the white man they obtain seal nets, fox traps and other products of civilization, in exchange for the products of the chase, and hence they soon become dependent on him to such extent that the discontinuance of a station becomes a veritable calamity. Mission houses have a special attraction for them, because apt to be more just than private traders, who are forced to make the most advantageous terms for themselves in a trade which at best is not very lucrative. On two visits, the Governor of Newfoundland, Sir William MacGregor, pronounced a very favourable opinion on the prospects of the settlement. However, the question whether the station is to belong to Newfoundland or to Canada is as yet undecided. In case Canada assumes possession, a lighthouse and a government building for revenue purposes are to be erected. As a central point for Hudson Strait and even for the whole region as far as Davis Strait, Killinek, in the author's opinion, is the best locality, its port being free from ice for a longer period than any other port in that region. This view is shared by A. P. Low, who visited the station in the *Neptune*.

Immediately on landing, Hantzsch yielded to the impulse most natural to the visitor of an Arctic land: to plunge into the midst of the Arctic nature and revel in its novelty. It is somewhat surprising to find from his description and photographs that this region, 2,100 miles from the Pole (Cape Chidley, 60° 34′ N. Lat.) is so thoroughly Arctic in character, hardly differing from Grinnell Land,

only 700 miles from the Pole. The 60th degree, after grazing Cape Farewell, the south point of Greenland, and leaving Iceland 460 miles to the north, traverses the Shetland islands, leaves Bergen a few miles to the north, touches Christiania, passes a little to the north of Stockholm, then close by Helsingfors and St. Petersburg, then through the middle of Siberia, cuts the neck of Kamtchatka peninsula and again that of Alaska Peninsula, hits Mount St. Elias, divides Canada into two almost equal halves, and completes the circuit of the globe by cutting off the northern third of Hudson Bay. Where it intersects the west shore of Hudson Bay, it crosses the line marking the limit of tree growth, which thence trends northwestward, reaching the 68th degree in Alaska and the 70th degree in Norway. In other words, the 60th degree, in running around the globe, touches no treeless land, except in nature's stepchild, Labrador. In looking at one of the author's photographs, "Typical landscape near Killinek (freshwater lake), 9 August," showing patches of snow close to the water's edge, the effect is heightened by the reflection that the same sun which was unable to melt that snow, only a few feet above sea level had looked down that day, in exactly the same latitude in the Old World, on smiling fields, gardens and orchards, and great cities, whose inhabitants were fain to seek the shade and fan themselves.

Every one who has passed along the Labrador coast has been struck by the peculiar appearance of the sky line. It is probably unique on the globe. There are no long, smooth sweeps of curves as in the wooded mountains of milder climes, nor sharp peaks and saw-toothed crests like those of the Alps or Rocky Mountains, but an infinity of little wrinkles, resembling nothing so much as cauliflower. Hantzsch's description and photographs supply the explanation. It is the result of ice work. All the sharp projections have been planed away by the ice sheet which at one time overspread all Labrador, eastern Canada and the northeastern United States. The tops of the ridges and crags have been ground down till they are as smooth as a marble floor. No vegetation can find a lodgment on such surfaces, not because the wind blows there with unusual violence, but because there is little rock decay and hence no foothold even for the spore of a lichen. Another source of joy to the stroller over Arctic lands are the level floors of fissures between rock walls, paved with the *débris* of ancient moraines, making a veritable macadam, as smooth as a gravel walk in a park. However, neither the tables or shelves of planed rock nor the graveled avenues of the fissures ever run far in the same direction. In the main, overland travel is a succession of climbs or jumps, of perpetual turns to right

and left, and occasionally a wide detour to circumvent a chasm or a vertical wall. Now and then a gorge will be found filled with boulders of all sizes, rounded as cannon balls, probably the product of furious whirlpools that seethed and roared beneath the ancient ice cap. Could mortal eye but gaze beneath the immense ice cap of Greenland, apparently so rigid, what scenes of tumult might be revealed!

One of the pleasantest features of this Arctic landscape are the thousands of little freshwater lakes, of crystalline purity, charming the eye by their very solitude. Most of them are shallow and of small extent, but some are of considerable size and depth. They occupy either basins scooped out of the solid rock by the ancient ice, or the floor of gorges dammed by moraines. Organic life in them is rather scanty. Cascades of all sizes are frequent. The wider valleys are apt to be occupied by swamps, covered by a carpet of grass, moss and willow, generally strong enough to bear the weight of a man, but occasionally luring him to a knee-deep plunge into the tenacious mud beneath.

With the delight of the true naturalist, Hantzsch next turns to the vegetal and animal life. As might be expected from the continuity with the Canadian mainland, that life is rather more abundant than in Greenland or the Arctic archipelago. It is indeed difficult to describe the pleasure one feels when, after walking for an hour over naked or at most lichen-coated rock, one suddenly comes upon a little sunny spot in the shelter of a rock wall, where a talus slope or the bed of an ancient glacier brook is gay with the yellow of the poppy or dandelion, the white of the saxifrage or the purple of the crowberry. Presently a butterfly, flitting from flower to flower, adds to the surprise by the suggestion of balmy days in brighter climes; or a humble bee may come buzzing about the traveller's head, generally much too swift and erratic for his net. The crowberry and huckleberry bushes are fairly alive with tiny gnats, so small that they disappear from sight almost as soon as seen, but suggesting an answer to the question how the innumerable little spiders earn their livelihood. Here and there a hairy caterpillar will be seen crawling in desperate hurry to a hiding-place, or if a plant be pulled up for a botanical specimen, a naked caterpillar will be found gnawing at its root. The dwarf willow and dwarf birch generally form an inextricable tangle with each other and with the moss and grass, so that it is almost impossible to obtain whole specimens, yet occasionally, spreading from a small fissure, where no other vegetation forestalled it, one of these beautiful representa-

tives of arboreal life may be seen forming an almost perfect circle, four or five feet in diameter, with its yellow stems running with almost geometric regularity from center to periphery. Why do they cling to the rocks, which of course are as cold or colder than the air, is the question which at once suggests itself. The reason is the same that causes the Eskimo to stoop when walking through a blizzard, and to put a foxtail as a guard around his face: to gain the protection of a layer of air as nearly stagnant as possible. Loss of heat by conduction neither animal nor plant fears in the Arctic, both being as a rule amply provided with non-conductors; it is the loss of heat by convection that is apt to be fatal.

As might be expected of an ornithologist, the author devotes most attention to the plumed fauna. Of land birds, indeed, there are not many: the snow bunting, whose merry song is heard almost constantly on every grassy slope; the ptarmigan, wonderfully pretty both in summer and winter dress; the raven, talking to its fellows in almost human tones, and changing its croak to a remarkably musical, metallic note in the love season. However, while the land is poor, the sea is rich, and thus the feathered tribe, like the "rational animal," is mainly found along the shore, looking steadily seaward for its breakfast, dinner and supper. In one respect this corner of Labrador seems to be less favoured than regions farther north or south, namely, in that so few species breed there. Out of the 98 species listed by Hantzsch, only 30 are recorded as breeding in this locality, and even of these, many are said to do so only occasionally. The great majority are described as "transients" or "visitors." One of the great attractions of northern Greenland and Baffinland is thus denied to this region, namely, the great colonies of looms, kittiwakes and especially of the dovekies, whose swarms, circling over their breeding places, look at a distance like the smoke from a chimney. In the Smith Sound region, at the northern end of Baffin Bay, on the contrary, there seem to be no "transients" at all; every species breeds, for the very good reason that they are there pretty close to the northern end of the land and especially to the northern end of permanently open water. It is fortunate that at the very moment when the animal wealth of these northern waters and the possible mineral wealth of these northern lands is beginning to attract attention, the Canadian Government has become interested in the "Conservation of Natural Resources for the Benefit of Posterity," so that the musk ox, seal, walrus, loom and dovekie may not have to share the fate of the reindeer of South Greenland and of the whale of Baffin Bay and Hudson Bay, or, worse yet, of the great auk. It

would be unpardonable if the "land of desolation" were allowed to be made still more desolate by being robbed of its most important resources.

Among fishes, the author mentions the cod, which seems to be abundant enough to be of commercial importance, and the capelin, caught in such quantities that one wonders how there can ever be danger of famine either in Newfoundland or in Greenland. Salmon are not caught at Killinek as a rule, though a little farther south their capture is carried on systematically on both coasts by the employees of the Hudson Bay Company. Sharks, sometimes 30 feet long, do great damage by getting caught in the seal nets and destroying them in their efforts to escape. The author gives no list of the seals found in the adjoining waters, though his incidental references to them prove that they are abundant, the sea in that vicinity being a seething mass of shrimps, the main food of the seal. Whoever knows of the veritable meadows of seaweed that cover the bottom of Arctic seas will no longer marvel at the wealth of animal life. In fact, studies in the North have pointed out* that for many marine organisms, the life conditions in the Arctic are actually more favourable than those of temperate and tropical seas, principally because of the practical uniformity of temperature, which does not vary more than about 5 degrees F. on either side of freezing point throughout the year. According to Dr. Hugh M. Smith† two million dollars' worth of seaweed is sold in Japan every year, besides large quantities which are consumed on the spot. Baffin Bay is a mass of seaweed, and Eskimo labour is probably cheaper even than Japanese.

Between August 11 and September 11, the author undertook two excursions, one southward along the shore of Ungava Bay, the other through MacLelan Strait to the islands on the Atlantic coast. On both occasions he was accompanied by an Eskimo man, Paksau by name, possessing many good and few ill qualities. Even in the short distance of half a degree of latitude—the extent of the southward journey—the vegetation grew decidedly more abundant, the topography less rugged, the land lower, and covered to a greater extent by soil and swamp, showing a change to a more continental character. At the south end of Ungava Bay, according to the Atlas of Canada, stunted conifers begin to make their appearance. The passage through MacLelan strait suggested reflections regarding its

* See Johannes Walther, "Einleitung in die Geologie als historische Wissenschaft," Jena, 1893–94, page 52.

† *Bulletin* 24, U. S. Bureau of Fisheries.

navigability. It remains free from ice for a longer period than either Hudson Strait or Gray Strait (between Cape Chidley and the Button islands, a small group about five miles to the north), and its width and depth are all that could be desired, but a serious obstacle may be found in the furious tidal current which carried cakes of ice past the author's camp "literally with the speed of a railway train," and which prevents the strait from being frozen even in midwinter. Having reached the eastern end of the strait, the author made for the largest of the outlying islands, which he called Neu Plauen, after his home, the famous manufacturing town near Dresden. Its summit, some 350 feet above sea level, affords a magnificent view over the Labrador coast, with stately headlands 2,000-2,500 feet high, and over the myriads of tiny islands, mostly flat, and affording breeding places to eiderducks. Great quantities of driftwood were strewn over the beach. All the shores in the vicinity are lined with ancient Eskimo houses, tent rings, fireplaces and graves. It would be a great mistake, however, to imagine that all these abandoned houses were inhabited at one and the same time, and hence to infer that the population was formerly more numerous. Eskimos even now build houses to please some special fancy, though there may be plenty of old houses close by, and a house once built remains forever, unless the alternative of frost and thaw causes it to slide slowly down into the sea, as happens occasionally, leading the unwary explorer into rash theories of recent land subsidence.

The rocks in the vicinity are exclusively igneous, no sedimentary rocks being found, except as erratics brought from a distance by the ancient ice. Numerous fissures, filled with white bands of quartz, reminding the Eskimos of slices of blubber, are seen to cross the smooth, polished surfaces of the gneiss, suggesting the possibility of ore deposits. That the land must at one time have stood much higher is evident at a glance from the numerous fiords, which are nothing else than drowned rivers, like Hudson River or Chesapeake Bay. It is suspected, in fact, that the glacial period was nothing else than a period of uplift. Were Labrador, eastern Canada and the northern United States raised even 5,000 feet above their present level, it is practically certain that a large part of them would once more be covered with an ice cap.

Compared, not with lands under the same latitude but with Arctic lands, this corner of Labrador seems fairly well dowered with animal and vegetal life. What of the "rational animal" for whose exclusive benefit the treasures of nature are supposed to exist? Life under the 60th degree of latitude is found decidedly endurable in

Europe, and thus from the geographic point of view there would be no obstacle to white colonization, especially since it would not have to face the long winter night, which at 80° N. lat. lasts 110 days, while at Cape Chidley the longest interval between sunset and sunrise, on December 21, lasts only 18 hours. The Newfoundlanders consider seal meat actually a delicacy. Perpetual rain is a condition to which the human tribe, like the anserine, eventually becomes accustomed, as proved in Scotland and in a part of our own State of Washington. When Hudson Strait becomes the avenue of a great commerce, which, according to A. P. Low, is sure to happen as soon as the Hudson Bay railway brings cargoes to a port on the west side of Hudson Bay, Killinek is bound to develop into a bustling port, and thus the great deterrent to the modern emigrant—isolation in the wilderness—will disappear. However, for some time to come, few white men other than missionaries and traders are likely to settle here, and thus the main human interest will continue to center in the Eskimos.

These good-natured, merry folk gained the author's amused sympathy, as they do that of every observer whose aim is to learn the truth rather than to tell a "spicy" story. At the time of the author's visit, the people were still heathen, but on March 1, 1908, the first lot of 18, having acquired the requisite convictions, were baptized, and 20 more were preparing for that transformation. A student of human nature can hardly fail to regret that some branch of this interesting "nation" of 40,000 souls, spread over all the Arctic coasts from Bering Strait to East Greenland, can not be kept in its primitive condition, with its own beliefs, traditions and habits undisturbed, except so far as may be desirable to save them from avoidable hardship. This, evidently, is not possible at Killinek, the future metropolis, nor hardly anywhere but in the Smith Sound region, the most northerly abode of human beings. Everywhere else, the natives are slowly but surely being drawn into the great leveling, equalizing stream of civilization. The presence of several halfbreeds, mentioned by Hantzsch, shows that in northern Labrador, as in Greenland, a process of colonization is going on which does not subject the "colonists" to the abrupt transfer from civilization to the wilderness. Through the natural preference of the natives themselves for the blood of the dominant race, Greenland, while remaining Eskimo in language, is fast becoming a white man's land. It is startling to see a blue-eyed man, and still more startling, a blue-eyed, golden-haired woman, beautiful enough to be an ornament to the most fashionable parlor, talking nothing but Eskimo, living on

blubber, in a hut made of sod, into which she has to crawl on hands and feet through a tunnel. Though not quite in harmony with the highest ethical ideas, this mode of displacement of one race by another is perhaps the gentlest. Nature here seems to reverse the law by which

> "So careful of the type she seems,
> So careless of the single life."

One who has acquired even a slight knowledge of the Eskimo language naturally pounces with avidity on the geographic and other nomenclature in works dealing with Eskimo-inhabited lands. It is to be regretted that in Labrador, as in Greenland, the Eskimos seem to have a mania for adopting European names, which fit them about as well as European clothes. Such names as Tauyungina, Tautyengwa, Igia, Angutiwdluahsu, Nasautiwdluahsu, Niakautya, Masauna, Koyaugito, Inuito, for men, Adlekasingwa, Inedlungwa, Akatengwa, Awiengorna, Mahsangwa, for women, among the Smith Sound natives, seem infinitely more fitting than such borrowed labels as Carl Dalager, Christian Broberg, Hans Matthiessen, among the Danish Greenlanders. In Labrador, as in Danish Greenland, all the above names would doubtless show a final k, which in the Smith Sound region seems to have practically vanished, while final t has been softened to n, both changes being decidedly in the interest of euphony. The specimens of Eskimo words given by Hantzsch are an additional proof of the remarkable uniformity of the language throughout its vast extent, suggesting that the expansion of the race may be of comparatively recent date.

DISCOVERY OF THE NORTH POLE.

A cable despatch from Dr. Frederick A. Cook, dated "Lerwick, Shetland Islands, Sept. 1," and printed in the *New York Herald,* of that date, announced that he had succeeded in reaching the North Pole on April 21, 1908. This was followed by despatches received from Commander R. E. Peary, U. S. N., dated at Indian Harbor, Lab., *via* Cape Ray, N. F., Sept. 6, announcing also that he had reached the North Pole on April 6, 1909. As Peary's report is much more complete than that received from Dr. Cook, a summary of this great culmination of Peary's Arctic work will first be presented here. Detailed accounts of the reports of both explorers will be reserved for a later occasion.

Peary's steamer *Roosevelt* left New York on July 6, 1908, and

arrived at Cape Sheridan, on the northeast coast of Grant Land, on Sept. 1. The party wintered there, transferring many loads of supplies as far west as Cape Columbia, hunting parties, meanwhile, bringing in a large amount of fresh meat (musk oxen, bear and deer), and the scientific staff took tidal and meteorological observations from Cape Bryant on the Greenland coast to Cape Columbia on the northern shore of Grant Land.

On Feb. 15, this year, twenty days before sunrise, Peary's sledge party for the North Pole left Cape Sheridan in five detachments and travelled west along the coast to Cape Columbia, the starting point for the northern journey. On March 1, they set out on the sea ice for the north and reached the Pole in 36 days. On the whole, the sledging conditions were not very unfavourable, though Peary was delayed about 14 days by water leads, leaving a little more than three weeks for the actual sledging work. The pace was remarkably rapid, and the journey from the mainland to the Pole was made at the average rate of a little less than twelve miles a day, including the long detentions. The average rate of the Italian expedition (the Duke of the Abruzzi) was only about 7 miles a day.

As the explorer advanced, the supporting parties, one after another, were turned back, and for the final dash of 140 miles there were left only 5 men (Peary, Matt Hansen, the negro, and 3 Eskimos), 40 dogs and 5 sledges. Sea ice covers the entire area around the Pole. Thirty hours were spent in making observations and taking a sounding, at the Pole and in its neighbourhood. The minimum temperature during this time was −30° and the maximum −12°. For 20 hours, the sky was cloudless.

Forced marches were made on the return by reducing the hours of sleep and otherwise saving time, as, for example, by occupying, at the halts, igloos built on the northern journey. The distance from the Pole back to Cape Columbia was covered in the wonderfully quick time of 16 days.

The three soundings which Peary took, on his northern trip, were full of significance, though it would have been desirable, had circumstances permitted, to have increased the number. About 50 miles north of Cape Columbia, a sounding showed a depth of 110 fathoms or 660 feet. His second sounding a little south of the 85th parallel, gave a depth of 325 fathoms or 1,950 feet. From the data the explorer gives, this place appears to be some 80 or 90 miles north of the coast of Grant Land. He had then passed beyond the continental shelf and the ice upon which he stood was over oceanic depths. His last sounding was within 5 miles of the Pole, where

all his line, 1,500 fathoms, was paid out without touching bottom, showing that the depth there was over 9,000 feet.

All known Arctic lands rise from comparatively shallow waters, and the inference will doubtless be drawn that there is no land between Grant Land and the Pole, if the constantly increasing depths indicated by Peary's soundings persist.

The explorer's equipment, in all respects, seems to have reached the nearest approach to perfection that has yet been attained and the brilliant success that has rewarded his efforts is now applauded by all the world. He seems also to have been favoured by unusually excellent natural conditions for his final attempt on the Pole.

Dr. Cook went north, in the summer of 1907, ostensibly on a hunting cruise, with Mr. J. R. Bradley, in Greenland waters. According to a signed statement by Mr. Bradley, his vessel was well equipped with supplies for an attempt to reach the Pole. Dr. Cook was landed in the Smith Sound region and spent the winter of 1907-8 at Annotok, a little north of Peary's old base at Etah. At sunrise in 1898, he started west, over Grinnell Land, to try a new route to the Pole over the waters west of that land leading to the Arctic Ocean. He had with him 10 Eskimos, 103 dogs and 11 heavily laden sledges. On the way to the west coast he secured a large amount of game. Taking to the sea ice at Land's End, a little north of Nansen Sound, he sent back his last supporting party after three days and pushed on with his two best Eskimos and 26 dogs. He was then 460 miles from the Pole and the date was March 21.

On March 30, in latitude 84° 47′ and 86° 36′ W. Long., he says he saw new land to the west, but had no time to explore it. The latitude mentioned is apparently about the same as that in which Peary determined approximately the edge of the continental shelf. Further north he found no evidences of any kind of life. He had considerable difficulty in curcumventing pressure ridges, and the eastern drift of the ice gave him much anxiety, but beyond the 86th parallel the travelling was much better. From the 87th to the 88th parallels he was surprised to find indications of land ice (?).

Approaching the Pole, astronomical observations were daily made to fix the position of the advancing stages, and the Pole was reached on April 21, 1908. He remained there two days and saw nothing but ice and no sign of life. From his third day on the ice, he had made the journey to the Pole at the remarkably rapid rate of a little over 15 miles a day. He was not nearly so much delayed as Peary was in the following season, by long detentions at water leads.

On the much slower return journey, he encountered a great deal

of open water and a rapid easterly drift of the ice. His difficulties were augumented by the near exhaustion of his food. The lives of the three men were saved, however, in Crown Prince Gustav Sea, a little north of Axel Heiberg Land, by the killing of a few bears. He pushed as rapidly as possible down toward Lancaster Sound in the hope of reaching a Dundee whaler, but as he found he could not get so far south, he crossed into Jones Sound, early in July. He passed the winter at Cape Sparbo, and as his ammunition was exhausted, game was obtained by bow and arrow, the lance, the knife and fishing line. Remaining in an underground refuge they had prepared till sunrise, this year, the three men started for the Greenland shores and reached Cook's winter camp at Annotok on April 15. Thence Cook moved far south to the Danish settlements, reaching Upernivik on May 21 last, and later he was able to take a Danish Government vessel for Copenhagen, where he arrived in September.

Doubts have been expressed, in some quarters, as to the authenticity of Dr. Cook's brief narrative, while, at the same time, his claims seem to have been accepted with implicit confidence in Denmark, where he has been received with great enthusiasm and the highest honours. It is hoped that recriminations, which can settle nothing, will cease, and that matters in dispute will be left to the adjudication of competent experts, who will pass upon the merits of the recorded observations and other testimony. It is understood that the Coast and Geodetic Survey has offered to act in this capacity.

The attainment of the North Pole, after the long quest of centuries, has naturally stimulated the most profound interest throughout the world. The effect upon Arctic exploration will doubtless be, it is gratifying to say, to center enterprise in that field upon more scientific investigations.

GEOGRAPHICAL RECORD.

NORTH AMERICA.

Soil Survey of Wisconsin.—The Wisconsin Geological and Natural History Survey and the College of Agriculture of the University of Wisconsin are soon to begin a co-operative soil survey of the state assisted by the Bureau of Soils of the United States Department of Agriculture. The last session of the legislature authorized the making of a soil survey and a soil map "to ascertain the character and fertility of the developed and undeveloped soils of the state, the extent and practicability of drainage of soil and wet lands and the means for conserving and increasing the fertility of the soils." The sum of $10,000 was appropriated annually for this work for the next two years.

SURVEY PARTIES IN ALASKA.—Fourteen field parties of the U. S. Geological Survey have been at work in Alaska during the present season. They comprise 12 geologists, 7 topographers and 3 engineers. Two parties have been working in southeastern Alaska, one in the Copper River region, two in the Matanuska coal region, one in the eastern part of the Kenai Peninsula, two in the Iliamna Lake region, two in the Yukon-Tanana region, one in the Koyukuk and Chandalar districts, one in the Norton Bay region, and one in Seward Peninsula. These surveys and investigations have been carried on under the direction of Alfred H. Brooks.

AFRICA.

THE GREAT EARTHQUAKE AND ERUPTION ON MT. CAMEROON.—Lieut. Boyd Alexander, well known through the scientific results of his recent two years journey in Africa, started in December last for the Gulf of Guinea Islands of São Thomé, Principé and Annobon, which he intended chiefly to study from a zoological point of view. He remained three months in Principé and then crossed over to Victoria in the Cameroons for the purpose of ascending Mt. Cameroon and comparing its fauna with that of the island. *The Geographical Journal* (July) prints a letter from him, written at Buea, on the mountain side, which especially relates to the great earthquake and the eruption of the volcano while he was high on the slope. Up to the time of the earthquake he had made an interesting collection of birds, chiefly from the forest.

On the night of April 26 he was sitting in his tent, at an altitude of about 6,500 feet, in the dense forest, when he felt a slight trembling of the ground, and less than two minutes later the mountain side was shaken by a terrible shock. The shocks were repeated at intervals of five to six minutes and during the night over 100 were felt. They were each preceded by terrific booms from the hills above the camp. Forest trees kept crashing and the cries of the terrified monkeys added to the confusion. He remained till 3 A. M., hoping that the disturbance would cease, but as the shocks only grew worse he abandoned the camp and with his men made a night march in the drenching rain to Buea.

An hour after he left camp it was buried under the stone that fell down the mountain side. At Buea he found that all the white men had gone to Duala. Old natives told him that, 36 years ago, there was a similar disturbance and that the lava stream took the same course to the northeast as on the present occasion.

On May 7 he returned from an inspection of the two burning craters, which, he says, were a wonderful sight. They are situated in the northeast part of the mountain and not far from its eastern edge. As the crow flies, he estimated that these craters are about seven and a half miles from Buea. He got within 200 yards of the larger crater, the diameter of whose top he estimates at 60 yards. Ashes fell on his clothes, several stones came perilously near him and the detonations were terrific. Great volumes of smoke, blue and black as ink, towered into the sky and were lit by flame, and enormous fragments of rock were shot into the air. The smaller crater, not more than 30 yards to the east of the large one, was in process of formation and far more terrible. Sheets of flame accompanied by showers of red hot stones were emitted rapidly and followed by appalling roars. The lava stream, about 3 feet 4 inches thick and 70 yards wide, had made its way down a wide valley and was still smoking. The desolation in the course of the lava stream was complete. Everything had been burned and trunks of trees

stood out like twisted iron. On the night of April 28 and for two nights after the whole northeastern sky was lit up, and as this phenomenon recurred on the night of May 7 he inferred that this glow came from the stream of lava just released from the second crater. Many of the natives accused him of being the cause of these convulsions.

EUROPE.

POPULATION OF FRANCE.—The *Official Journal,* reporting the statistics of population of France for the year 1908, gives a more encouraging view of the situation than has appeared for years past. The figures for 1908 show that 315,928 marriages occurred in that year, the average for the ten previous years having been 299,885. The number of births was 825,423, being an excess of births over deaths of 46,441. The average excess of births over deaths for the ten preceding years was 40,550. The number of deaths was the smallest in eleven years, while in births there was a recovery from the minimum of 1907 and marriages were 5 per cent. greater than the average for the ten earlier years.

POLAR.

SUPPLIES FOR PEARY.—The schooner *Jeanie,* 88 tons, sailed from St. John's on August 3 with 50 tons of coal and the same amount of stores, which are to be landed at Etah, Greenland, to supplement the supplies of Commander Peary. If the explorer has carried out his proposed journey to the North Pole he is likely to be on the way home; if not, the additional supplies may be of much importance to him in a renewed attempt to reach the Pole which he may contemplate for the next sledging season. The *Jeanie* will return after landing her cargo bringing despatches which Peary may have sent or left for her.

NANSEN'S NORTHERN CRUISE.—The London *Times* reports that Dr. Nansen has left Norway on a small private yacht for a cruise in northern waters. The cruise will not be completed till the end of autumn and will cover the Norwegian Sea toward Iceland and may possibly be continued to Greenland. Nansen's purpose is to continue his studies of sea currents and temperatures, which have an important bearing on questions of the fisheries and climate of Norway.

ANNEXING A BIT OF THE ANTARCTIC.—The *Scottish Geographical Magazine* (Aug., 1909) says that the British government has declared South Georgia, the South Orkneys, South Shetland, the South Sandwich Islands and Graham Land in West Antarctica to be dependencies of the Falkland Islands and under the jurisdiction of the governor of those islands. South Georgia has been a dependency of the Falklands since 1775, having been annexed by Great Britain in that year. The South Shetlands, however, were at one time claimed by Argentina, and the same country is using the South Orkneys for the meteorological observatory which it took over from the *Scotia* expedition and still maintains. The South Sandwich group is still unexplored, though it has been visited by sealing vessels. This annexation of part of the Antarctic regions is the first attempt to lay serious claim to South Polar lands. The Antarctic area has been a No-Man's Land. The annexation is doubtless due to the fact that these waters are now visited by a con-

siderable number of whalers and an active revival of the whaling industry is in progress there. The latest letter received from Dr. Charcot, leader of the French South Polar Expedition (*Bull.*, June, 1909, p. 386), written at Deception Island, South Shetland, on Dec. 24, last year, reported that this island had become an important center for whaling carried on by 200 Norwegians with 10 vessels. Norwegian and Argentine whalers are also obtaining many thousands of barrels of oil every year from the new whaleries at South Georgia. Another whaling station has been established at New Island, a bit of land in the Falkland group. Hereafter a whaler must pay for an annual license at the Falkland Islands before he will be allowed to fish in these wide-spread waters or to make use of the island harbours.

CLIMATOLOGY.

NORMAL TEMPERATURE AND PRECIPITATION OF THE UNITED STATES.—In *Bulletin R* of the Weather Bureau, Professor F. H. Bigelow has given the normals of the daily temperature and the daily precipitation for a large number of Weather Bureau stations. The temperature normals were obtained by plotting on a large sheet the monthly normals, drawing a curve through the twelve points representing the months, and then scaling off the temperature for each day. The monthly means were then taken from these values, and in case of any discrepancy between these monthly means and the original monthly normals the curve was slightly readjusted, so that the two monthly means should be in very close agreement. The daily normal temperatures for the several stations, obtained in this way, are given to the nearest degree.

The daily normals of precipitation were obtained as follows. All available records for each day in the year were collected for each station, the means obtained, and the results plotted. These curves were usually rough, consisting of broken lines. In order to approximate closely to the daily normal values which would be derived from a very long series of observations, the mean values of successive eleven dates were used as the means for the different days. For example, the January 1-11 mean was entered as the mean for January 6; the January 2-12 mean was entered as the mean for January 7, etc. Thus the normal values for each day in the year were obtained. This, it will be noted, being a process of rather extreme "smoothing," tends to spread the excessive values of individual dates backward and forward through ten dates on each side of their occurrence. The records of short periods were corrected by reference to adjacent stations having records of longer period.

The tables published in *Bulletin R* are now in use in the climatological work of the Weather Bureau throughout the United States. R. DEC. W.

NO CHANGE OF CLIMATE IN EGYPT.—The question of possible changes of climate in Egypt, during recent years, was discussed by Mr. B. F. E. Keeling, in a recent number of the *Cairo Scientific Journal*, and a summary of Mr. Keeling's paper was printed in *Nature*, May 13, 1909. The mean temperatures at Abbassia during the period 1870-1908 show no differences which are greater than those likely to be caused by differences in the exposure of the thermometers. Humidity, also, gives "very little evidence of any decided change during the last forty years." The same is true of rainfall. R. DEC. W.

PHYSICAL GEOGRAPHY.

SAND-BLASTING IN THE COLORADO DESERT.—Sand-blasting in arid regions is a well-known geological process. Sometimes this interesting action of wind-blown sand becomes of immediate economic importance to man. Thus, in the Colorado Desert, the telegraph poles of the Southern Pacific Railway are worn away near the ground, and have to be protected by posts or piles of rock. The more resistant knots or rings of growth are brought into relief by the etching of the softer parts of the wood. The fish-plates and bolts of the railway tracks are eroded rapidly, and tin cans strewn along the tracks are kept bright and polished by the driving sand, and are quickly etched through, as by acid, and worn away. In *Water Supply Paper* No. 225, of the U. S. Geological Survey, from which the foregoing facts are taken, there is a picture of a telegraph pole near Palm Springs Station, which shows the deep cutting by the wind-blown sand, and the pile of rocks put up to save the pole from being cut through. R. DEC. W.

THE MAGNETIC SURVEY YACHT CARNEGIE.—This new vessel, built for the magnetic survey work of the Carnegie Institution, was launched at the shipyard of the Tebo Yacht Basin Company, Brooklyn, on June 12. Dr. L. A. Bauer, Director of the Department of Terrestrial Magnetism, has sent to the Society an illustrated pamphlet dealing with the construction of the new boat, her object and her work. The yacht is practically non-magnetic. There are no magnetic materials in the vessel excepting the cast-iron pistons in the cylinders of the internal combustion engine and the steel cams required for operating the valves. As the *Bulletin* has already announced, the Department of Terrestrial Magnetism of the Carnegie Institution is undertaking to carry out a magnetic survey of the earth in about 15 years, and, in connection with this project, the magnetic survey of the oceans has been assigned to the new yacht. This work will be done under the direction of Dr. L. A. Bauer, the head of the Department, and he will be represented on the *Carnegie*, as chief of the party, by Mr. W. J. Peters, formerly of the U. S. Geological Survey, who gained great experience in such ocean surveying when in command of the magnetic survey yacht *Galilee* in 1906-8. As has been reported in these pages, the *Galilee* has made a general magnetic survey of the Pacific Ocean, the length of her cruises amounting to 60,000 nautical miles. The *Carnegie* will begin her work in Hudson Bay, and is expected to make a magnetic survey of the Atlantic and Indian Oceans and to complete that of the Pacific.

The *Carnegie* left New York early in August for a cruise of six or seven months in Hudson Bay and the North Atlantic, returning via Madeira and Bermuda. The vessel is in command of Mr. Peters, with Captain C. E. Littlefield as sailing master; Dr. C. C. Craft, surgeon and observer; Messrs. J. T. Ault, E. Kidson and R. R. Tafel, magnetic observers, and F. D. Smith, observer-engineer. The crew consists of 2 watch officers, 8 seamen and 2 cooks.

ECONOMIC GEOGRAPHY.

THE NATURE OF COMMERCIAL OR ECONOMIC GEOGRAPHY.—Avard Longley Bishop, Ph.D., Assistant Professor of the Science of Society in Yale University, has a paper with this title in the *Yale Review* (May, 1909). In his opinion, the present text-books on this subject are too comprehensive and in many cases are overloaded with meaningless statistical data. The latter criticism is undoubtedly

valid. His suggestion, however, that the minor countries and products should be eliminated from the text-books or only incidentally mentioned, is probably too sweeping. Some of the minor regions largely monopolize the production of commodities well worth knowing; and the practical study of economic geography is nowhere more intensive to-day than in wide areas of the newer lands of which the white races had little or no knowledge a few years ago. His suggestion that the influence of physiographic factors upon man and the geographic and human controls over the production, transportation and marketing of commercial products should have more prominent attention in the text-books will doubtless be approved by the best teachers. Dr. Bishop's paper is a suggestive and valuable contribution to this important department of geographical study.

VARIOUS.

NEW FEATURES OF PETERMANNS MITTEILUNGEN.—In its August number *Petermanns Mitteilungen,* under the new editorship of Prof. Paul Langhans, has greatly enlarged its monthly report of geographical news, which fills six pages of small type. It includes many personal and obituary notes, reports on honors awarded, reports on congresses and the proceedings of geographical and allied societies, and summaries of geographical exploration in progress in all parts of the world. Two new departments have been introduced—(a) a classified list of new geographical works, critical notices of them being reserved for the *Literaturbericht,* and (b) reports on the progress of cartography and the most conspicuous new maps, which introduce the monthly list of new maps, now in its second year of publication. Circulars have been sent to geographers in all parts of the world requesting them to supply the new departments with the latest information.

HONOURS CONFERRED.—At the recent anniversary meeting of the Royal Geographical Society, the Victoria Research Medal was awarded to Professor Alexander Agassiz for his achievements in oceanographical research; the Founder's Medal to Dr. Stein for the results of his second journey in Chinese Turkestan; the Patron's Medal to Colonel Talbot of the Royal Engineers for his mapping of extensive areas in Asia, Egypt and the Sudan; the Murchison Award to Captain Rawling for his surveys in western Tibet; the Gill Memorial to Commander Whitehouse, Royal Navy, for his successful completion of the triangulated survey of Victoria Nyanza; the Cuthbert Peak Grant to Captain Ommanney, Royal Engineers, for his determinations of longitudes in Northern Nigeria; and the Back Grant to Rai Sahib Lal Singh, the Indian surveyor who accompanied Dr. Stein on his latest expedition.

APPROPRIATIONS FOR SCIENCE.—The Paris Academy of Sciences, through its committee, has appointed 4,000 francs of the Bonaparte fund to enable M. Cayeux to pursue his researches on the fossils of the oolitic iron deposits in the U. S.; and 4,000 francs to M. Chevalier, to help him carry on his geographical and ethnographical researches in the French colonies of tropical Africa.

NATIONAL MUSEUM OF MEXICO.—The old Museo Nacional of Mexico was, in February last, divided by the government into two independent institutions—the Museo Nacional de Arqueología, Historia y Etnología and the Museo Nacional

de Historia Natural. The first number of the *Anales* of the National Museum of Archæology, History and Ethnology, which appeared in May, follows the general plan of the *Anales* of the old Museum excepting that the various branches of natural history are not treated in its pages.

OBITUARY.

E. DELMAR MORGAN.—This geographer, traveller and Russian scholar died in London on May 18 at the age of 69. He had travelled extensively in Asia, Africa, and Russia, translated into English Prjevalsky's "Travels in Mongolia and Northern Tibet," edited a number of important geographical works, and was for years a member of the Council of the Royal Geographical Society and a frequent contributor to its publications.

MAJOR CECIL MURPHY, R.A.—Major Murphy died on April 16 in London. He was the last surviving member of the Cameron expedition to Africa and accompanied the remains of Dr. Livingstone when they were taken from the place of his death to the east coast of Africa.

MADAME SIGNE RINK.—The widow of the well known Danish geologist and authority on Greenland died at Christiania on April 19, aged 73. Born in Fredrikshaab, Greenland, where her father was overseer of the Danish Colony, her thorough acquaintance with the natives made her a valuable assistant to her husband in his scientific work. She was the author of several Greenland novels, wrote on the Greenland natives and, after her husband's death, revised his scientific manuscripts for publication.

TH. MELLARD READE.—This geologist died in Liverpool on May 26, aged 77. He was president, at various times, of the Liverpool Geological Society. His most important works were: "The Origin of Mountain Ranges" (1886) and "The Evolution of the Earth's Structure" (1903).

PROF. DR. ERNST VON HALLE.—This German geographer died in Berlin on June 28, aged 41 years. He travelled extensively in North and Central America. His best known writings are "Amerika, seine bedeutung für die Weltwirtschaft" (1905), "Die grossen Epochen der Kolonialgeschichte" (1907) and "Die Weltwirtschaft" (since 1906).

F. B. JOHNSON.—Died in Uganda in June aged 39. Missionary and explorer. He was the first European to travel completely around the Ruwenzori mountain group and wrote "Tramps around the Mountains of the Moon."

PROF. DR. VITT. RAFF. MATTEUCCI.—Died on July 15, aged 48 years. He was internationally known as the Director of the Observatory of Vesuvius and was also a member of the geological staff of the University of Naples.

GEOGRAPHICAL LITERATURE AND MAPS.

(INCLUDING ACCESSIONS TO THE LIBRARY.)

BOOK NOTICES.

Wie wandere ich nach Deutschen Kolonien aus? Ratgeber für Auswanderungslustige. Von Dr. Oscar Bongard. Second Edition. 71 pp., Illustrations from Photographs and Index. Wilhelm Süsserott, Berlin, 1908. Price, 60 pf.

The book is packed with information and advice for intending settlers in the African colonies of Germany. The well-known author has travelled extensively in these colonies, and his book covers all phases of information of importance to the settlers, from the outfitting for the journey and the diseases of Africa to the various fields in which the emigrant may hope to find suitable openings and succeed in making a new home for his family. He sets forth the dangers that are to be avoided and the hardships that are inseparable from pioneer life under entirely new conditions. One of the pictures shows a native herdsman wearing a silk hat while tending his cattle. Dr. Bongard has faith in the practicability and the advantage of white colonization in many selected districts of the colonies.

A Naturalist in Tasmania. By Geoffrey Smith, M.A. 151 pp., Illustrations, Index and Map in Colours. Clarendon Press, Oxford, 1909. Price, $2.50.

A charming book both for the specialist and the general reader. It is not too much to say that the atmosphere of the volume and the impression it makes suggests Bates's "A Naturalist on the River Amazons." The author has imagination that gives warmth and interest to every page; but he is also a naturalist; and a writer who has both imagination and the endowment and training of the scientist can write books that are useful to the scholar as well as edifying and pleasing to the public. Mr. Smith's topic is an Australian island a little larger than Wales and smaller than Ireland. Tasmania has inexhaustible interest and great natural riches. Its early days afford unusual material, and the author has well sketched the pioneer explorations, the founding of Hobart, the wild and adventurous times of the bushranger, the characteristics and the final extinction of the aborigines. Hobart and the Midlands, English in their appearance, with rich cultivation and pasturage, the mountains, table-lands, lakes, forests and coasts are all described; and the pages, after the historical chapter, tell of the life of the settlers, the scenery, the vegetation, the characteristic fauna, the wild animals of the bush, poisonous snakes, etc. In the concluding chapter, the author discusses the survival of ancient types of animals and plants, the derivation of the fauna, the former connection with South America and New Zealand through an Antarctic continent, the separation of Tasmania from Australia and special Tasmanian problems. The photographs and drawings, many of them by the author, are good, and the geological map is from that made by the Lands and Surveys Department.

Deutschland nebst Böhmen und dem Mündungsgebiet des Rheins. Die geographische Gestaltung des Landes als Grundlage für die Entwicklung von Handel, Industrie und Ackerbau mit besonderer Berücksichtigung der Seestädte. Von Prof. Dr. Albert Zweck. x and 238 pp., 42 Illustrations in the Text, and Index. B. G. Teubner, Leipzig, 1908. Price, M. 4.

A study of the industrial and commercial conditions of Germany as based upon the geology of the country and its physiographic features. These factors are, of course, fundamental in their influence upon the development of human enterprise. Future books on economic geography will be partly judged by the adequacy with which they treat the influence of geology and physical geography in shaping and directing man's work. Dr. Zweck's book is an admirable example of this method of developing the subject of economic geography. He applies it to all parts of Germany, gives the essential facts relating to their geology, the genesis of their land forms and soils, the effects of these factors upon production, the influence of climate, the origin and distribution of coal, iron and other mineral resources, etc. In discussing the low plain of the upper Rhine (*Oberrheinische Tiefebene*), for example, he tells of the sinking of this "Grabenbruch" from the Tertiary to the Ice Age; of the later Tertiary and Quaternary deposits that covered the sunken area, especially with loess, which tillers of the soil have found to be peculiarly adapted for the cultivation of cereals, orchard fruits, the vine and hops; of the warmer climate of this valley plain, hemmed in by hills, giving it the warmest and longest summer in Germany and thus intensifying the effect upon production of the superior soil. While Dr. Zweck emphasizes natural influences, he does not fail to show what human genius and invention have done to stimulate the wonderful development of industry in the past generation. Part II is a study of the trade and communications of Germany. The book may heartily be commended to teachers as a logical, forceful and scientific method of presenting to students the subject of economic geography.

Régions naturelles et noms de pays. Étude sur la région parisienne. Par M. L. Gallois, prof. adj. à l'université de Paris. Librairie Armand Colin, Paris. 1908. Pr., fr. 8.

The word country (pays) is used in this treatise in the same meaning that R. T. Hill found attributed to it colloquially in certain parts of Texas, namely, designating "local districts" whose names are derived either from their locations or from "specific natural features" of the respective regions. The geography of the Old World is especially rich in such "country" names which are often entirely different from the political nomenclature of the region, and the author's object in this book is to determine, in the case of the Parisian region, whether these popular names actually correspond to "specific natural features" and thus represent distinct natural divisions of the country, and if so to determine the character of these natural features that are at the bottom of this distinction. He has spared no pains to ascertain the history and application of each name both from ancient geographies and maps and from actual observation and examination of the inhabitants and the ways in which they use these names, and, after a careful analysis of each case, he makes the following classification:

The first group of these names has a purely historical origin. They are, either names of former provinces or military governments corresponding, to a certain degree, to the old feudal domains which had grown up in the course of

political events, such as Brittany, Normandy, Burgundy, Lorraine, etc., or names of old-time counties, such as Valois, Gâtinais, Vexin, etc. The second group is characterized by the derivation of the country name from the name of the city, such as Montois, Laonnais, Soissonnais, etc., each meaning simply the environs of that respective city, and hence without any special geographical value. The third is the really geographical group, because the names belonging to it have been in use for centuries without ever designating any political division, such as Beauce, Brie, etc. They were used, indeed, to designate ecclesiastic subdivisions, dioceses and the like; but in each case the name was older than its clerical use, and the clerical division was named after the country, not *vice versa*. So there is no doubt that with regard to these names the popular nomenclature originated in the character of the country itself. Those distinctive features which characterize the region to which such a name applies are as a rule its agricultural aspects, which is no wonder in a country so eminently agricultural as France. While, of course, geological differences underlie these more superficial criteria, there is no direct connection between them and the popular conception of the name. Thus Beauce, for instance, while coinciding with the limestone plateau which extends toward the Loire River south of Paris, is to the peasant the rich wheat country. Gâtinais, on the other hand, while historically the country on both sides of the Loing River, has, under the influence of different geographical conditions, suffered a restriction of the popular signification of the name: at present Gâtinais means the country of vineyards on the western bank of that river, while the country on its eastern bank, a country of orchards and cider, is popularly distinguished from it as Puisaye. Still another case is that of Multien, which once meant the country around Meaux, but under the influence of the famous Beauce, whose culture extended into it, the name disappeared in the part adjoining that region and what is now left of it is localized in the northern part of its former area, so that Meaux itself does not belong to it any more—a case of migration and restriction of a country name which resembles very closely the fate of the name of Saxony on German soil, save that in the latter case the change was due to political instead of cultural, factors. The chief cities of these natural regions are not, as a rule, located in the centre, but owing to the fact that the "country" name designates an economic or cultural unit, they have sprung up along the boundaries of the various regions, under the influence of the contact of contrasting products, and the exchange and commerce connected with them.

The appendices are no less valuable than the text. One of them contains a practically complete cartography of the Parisian region because, in his consultations of the old maps with regard to the use of the names, the author handled almost every one of them that is accessible and was able to make a classified catalogue of them which is in itself a very valuable contribution to the historical geography of this part of France. Eight plates reproduce the most interesting features of some of these maps. M. K. G.

Le Berry. Contribution à l'étude géographique d'une région française. By Antoine Vacher of the University of Rennes. Paris, 1908. Librairie Armand Colin. Pr., 15 fr.

The old province of Berry, the country inside the great bend of the Loire River, is one of the historico-geographic divisions of France. The author wishes to determine if it is the product of purely political influences, or if natural factors have entered into its becoming such a well-defined unit. With this point in view,

he has worked up the entire physical geography of the country inclusive of its conditions in past ages, from the first remarks about the country of the Bituriges in Cæsar down to the present. He thus finds that its natural boundary originated in a region of swamps along its southern border whose condition, even with the improvements of modern times, still shows a marked contrast with the intensely agricultural character of the Berry proper. Politically it changed from a Roman *oppidum* to a mediæval diocese, and a feudal duchy, until it was divided up into "départements" during the Revolution, so that the old name survived only as a "nom de pays." Political and geographical conditions have thus worked hand in hand to produce a geographical unit of well-defined individuality. The name of "contribution" to the geography of this region is very modestly chosen, as hardly any aspect of its physical geography has been left untouched. Its boundaries old and new, its cartography, topography, hydrography, climate, are exhaustively treated. A short analysis of the "noms de pays" current in this region forms the conclusion of the book, which is amply illustrated with plates, diagrams, charts, and tables. M. K. GENTHE.

The Face of the Earth (Das Antlitz der Erde). By Eduard Suess. Translated by H. B. C. Sollas under the direction of W. J. Sollas. Vol. II, pp. vi and 556; Vol. III, pp. vii and 400, Maps, plates and text ill. The Clarendon Press, Oxford, 1906, 1908.*

At last all the English-speaking world has its own version of the whole of Suess's wonderful treatise upon the physiographic geology of the globe, as far as it has appeared in the original German. For many years this work has been familiar to the scientific world in its German form, and its influence has been vastly extended by the masterly version published in French in 1897, 1900 and 1902 by E. de Margerie and a coterie of authoritative collaborators. The French edition brought each volume up to the date of its appearance by supplementing the original with intercalated paragraphs, references and illustrations showing the advance of the rapidly growing science. The English version, however, is an exact translation, paragraph by paragraph, without note or comment or added reference or figure, and therefore shows the state of the science of geology, as it existed just prior to the publication of the German volumes eighteen to twenty-five years ago, without taking into account the vast advances of the intervening period. Although the English version is a mere translation, it has been made by masters of geology as well as of English, and the usually idiomatic language used carries the reader along through the presentation of facts and theories in the charming manner of the original. The clearness of Suess's style pervades the translation, so that the book is adapted to the lay as well as the professional reader and should find extensive circulation. In the rendition of the third volume, Professor Sollas has associated with himself nine English Colonial and American geologists of international reputation, but, to quote from the translator's preface, "The reverence due to a great classic has restrained us in this, as in previous volumes, from taking any liberties with the text, whether by comment or emendation. Our sole aim has been a faithful rendering."

The general public should understand at the outset that the title of this work, "The Face of the Earth," hardly gives an adequate idea of its scope and character. It is not a mere description of the earth's surface; in fact word pictures of scenery are not to be found in it. On the contrary, it is an exhaustive treatise

* Vol. I was reviewed in the Bulletin, Vol. 38, pp. 325-327, 1906.

on dynamic geology, in the effort to account for the relief of the globe, not only at present but also at sundry periods in past geologic time.

In the first volume Suess describes in broad terms, first the movements of the outer crust of the earth, then the character of the existing mountain ranges. Volume II is devoted entirely to the consideration of the sea. As usual, Suess introduces his theme with a concise review of the history of the changes in theory that have taken place. In order to avoid the use of the terms "sinking" and "rising" of the land, because they imply adherence to a particular theory accounting for the changes in the relations of sea and land, the author introduces the expressions "positive displacement of the strand-line" for sinking of the land with consequent advance of the sea, and "negative displacement of the strand-line" for elevation of the land with consequent retreat of the sea. The outlines of the Atlantic and Pacific Oceans are sketched in with broad strokes and then the two oceans are compared and contrasted. Regarding the former Suess says: "The inner sides of folded ranges, jagged rias coasts which indicate the subsidence of mountain chains, fractured margin of horsts and fractured tableland form the diversified boundary of the Atlantic Ocean." Concerning the latter he writes: "With the exception of a part of the coast of Central America in Guatemala, where the bending cordillera of the Antilles has sunk in, the whole border of the Pacific Ocean, wherever it is known in any detail, is formed of mountain chains folded towards the ocean in such a manner that their outer folds either form the boundary of the mainland itself or lie in front of it as peninsular and island chains."

The author then passes on to the consideration of the seas during certain geological periods, and in three illuminating chapters gives a survey of some of the results of researches in stratigraphic geology. Regarding the Paleozoic seas, Suess concludes that "Positive and negative movements alternate simultaneously over regions of such vast extent that they cannot be explained by a bulging or a sagging of the lithosphere on however great a scale." The seas of Mesozoic time are then reconstructed and investigated with the same negative result as to the adequacy of explanation offered by mere subsidence and elevation of the land. Tertiary time was a period of great recession of the ocean, but there seems to be no proof of general change being now in progress. The existing oceans differ as to age. Suess holds that the famous terraces of the fiords of Norway are not conclusive proof of the recent elevation of that coast; on the contrary, the great majority of them are to be regarded as monuments of the retreating ice of the glaciers. Nevertheless, he admits that negative displacement of the strand-line of the peninsula did occur during and after the period of maximum extension of the ice in Norway.

On account of its importance in the history of geological thought, a whole chapter is given to the question of the oscillations of the Temple of Serapis at Pozzuoli. Suess concludes that the famous columns record merely two changes of level due to local conditions in an enormous volcanic crater, which therefore have no general significance. A minute investigation of the Baltic and the North Seas leads to the conclusion that some of the elevated beaches and stranded material there are the result of recent (1872) exceptional storms, and that all may well be explained in the same manner. The explanation is extended to other regions with similar coastal configuration. "The Mediterranean region has so far afforded no proof of a secular continental elevation or subsidence within the historic period." The evidence for the sinking of the east coast of

North America from New Brunswick to South Carolina is considered to be wholly inadequate and the well-known facts are explained in other ways, while attention is called to certain fixed points which are exactly the same as they have been for the past 300 years.

These and many other localities and regions are cited to show that there has been no change in the relative level of sea and land within historic time and that "Measurable changes along the coast are, therefore, apart from various meteoric influences, confined to loss of land through the erosive action of the sea; to gain of land from the deposition of sediment; to sudden local subsidence of large tracts of alluvial land covered with forest or buildings; to local oscillations in the vicinity of volcanoes; and finally, but only in rare cases, to true dislocations affecting the coast, as occurred in Cook Strait in New Zealand in 1856."

Suess rejects as inconclusive the evidence of elevation along the west coast of South America in connection with the famous earthquakes of the first half of the Nineteenth century.

The first half of the third volume, which is all that has yet appeared in German, is devoted principally to the mountain ranges, ancient and modern, of Asia. The importance of the Siberian plain is brought out as being the region in which several of the old mountain systems have died out and become buried. The trend-lines of the great mountain systems are seen to describe vast and harmonious arcs indicating a common vertex in the interior of the continent. In the words of our author, "This common vertex is situated close to a crescentic fracture which surrounds the region of Irkutsk like an amphitheatre. Near the eastern border of this amphitheatre lies Lake Baikal." This vertex is called the pre-Cambrian vertex. Another and more recent vertex, the Altai, lies to the southward, while there is a great series of marginal arcs still farther south. With this as his thesis, Suess gives a connected general idea of the eastern part of Eurasia which is inspiring to the geologist, whether later invetigations shall prove its every detail correct or not.

The last two chapters of this part of Volume III are devoted to Asia Minor and the eastern Mediterranean and the broad zone stretching northward throughout Europe. Here are shown the relations of the Tauride Mountains to the Dinarides and the Carnic Alps, of the Urals to the Caucasus, of central Russia to the surrounding mountains, of Scandinavia to Scotland.

Throughout the whole of Suess's great book, the reader is amazed at the breadth of reading and study displayed and the thoroughness with which all the bewildering mass of data now available has been digested and discriminatingly utilized. One is constantly charmed by the clearness of statement, the cogency of reasoning and the frankness regarding opposing views shown everywhere throughout these volumes. The limitations of present knowledge are carefully indicated. Geographers as well as geologists should possess themselves of this work not only on account of its store of valuable facts and references and its discussions, but also because its careful perusal and study cannot fail to give the reader a broad view of science in general and leave his mind more open than before to the reception of suggestions from every worthy source. E. O. H.

The Story of New Netherland. The Dutch in America. By William Elliot Griffis. xv and 292 pp., 13 Illustrations and Index. Houghton Mifflin Company, Boston and New York, 1909. $1.25.

This is the story of the Dutch settlers in New Netherland and what are now

the Middle States. Dr. Griffis tells what manner of men they were, how they struggled for their rights and won in their long contest, first against a selfish corporation and then against English Dukes and Kings; how they resisted every attempt of the English to fasten a state church upon the American people; how loyal their descendents were to the Continental cause and Congress and how much we Americans still owe to their enduring influence. The book is a suggestive contribution to the serious study of our national origins other than English and it is the outcome of long labour in the collection of material at home and abroad. Both the literary style of the author and the inherent interest of the subject make the work very readable.

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NEW MAPS.

NORTH AMERICA.

U. S. GEOLOGICAL SURVEY MAPS.

UNITED STATES.—Geologic Atlas of the United States.—No. 160. Accident-Grantsville Folio (Md.-Pa.-W. Va.) The Accident and Grantsville quadrangles are adjacent, and chiefly in the N. W. corner of Maryland. Mostly agricultural; 161. Franklin Furnace Folio (N. J.) Includes special map of Franklin Furnace on a scale of 1,200 ft. to an inch, showing the topography and economic geology of this iron and zinc region; 162. Philadelphia Folio (Pa.-N. J.-Del.) Consists of the Germantown, Norristown, Philadelphia and Chester quadrangles, a part of the Piedmont Plateau; 163. Santa Cruz Folio (Cal.) Includes parts of San Mateo, Santa Cruz, Santa Clara and Alameda Cos. With two plates of photographs illustrating geological formations and characteristic fossils; 164. Belle Fourche Folio (S. D.) Embraces the Belle Fourche quadrangle in parts of

Butte, Lawrence and Meade Cos.; 165. Aberdeen-Redfield Folio (S. D.) Includes the Northfield, Aberdeen, Redfield and Byron quadrangles comprising nearly all of Spink and parts of Faulk, Hand, Edmund and Beadle Cos.; 166. El Paso Folio (Tex.) In the extreme northwestern part of trans-Pecos Texas, a region of mountains and intermontane plains. With plate of photographs illustrating formations.

U. S. HYDROGRAPHIC OFFICE CHARTS.

Pilot Chart of the North Atlantic Ocean, July, 1909. On the reverse, the Hydrographic Office begins the printing of questions of general interest sent to it, relating, for example, to the range of tides on the Atlantic and Pacific sides of the Isthmus of Panama, deep sea soundings, the greatest known ocean depths, magnetic variation, etc. It is intended thus to publish, from time to time, the replies of the Hydrographic Office to such inquiries, for the benefit of all who may be interested.

Pilot Chart of the North Pacific Ocean, August, 1909.

UNITED STATES.—Sketch Map showing the geology of a Portion of Louisiana and S. E. Texas with the Location of the Salines, etc. *Econ. Geol.*, Vol. 4, No. 1, Lancaster, Pa., 1909. Illustrates "The Geological Occurrence of Rock Salt in Louisiana and E. Texas," by G. D. Harris.

UNITED STATES. CALIFORNIA.—Relief and Mineral Map of California. No scale or map net. Showing the Topography and approximate Locations of all the principal Mineral Deposits, together with Statistics of Mineral Production. California State Mining Bureau, Lewis E. Aubury, State Mineralogist, San Francisco, 1908. Nine symbols show the distribution of gold, copper, quicksilver, oil, natural gas, coal, salt and crude borax and soda. The production, in 1907, of each kind of metals and minerals is given. Another map of the state, on the same sheet, with relief effect, gives some idea of the surface features; and on a small outline map of the State is imposed 10 other States of the Union, including New York, Maine and Ohio, with considerable room to spare.

CANADA.—Coal Fields of Alberta. Scale, 135 miles to an inch. *Econ. Geol.*, Vol. 4, No. 1, Lancaster, Pa., 1909. A black and white sketch map illustrating "The Coal Fields of Alberta," by D. B. Dowling.

CANADA.—Preliminary Geological Map of the Gowganda Mining Division, District of Nipissing, Ontario. Scale, 1:63,360=1 mile to an inch. 47° 30′-48° 5′ N. Lat.; 80° 20′-81° 5′ W. Long. In Colours. Illustrates "Preliminary Report on Gowganda Mining Division, Nipissing, Ont.," by W. H. Collins. Department of Mines, Ottawa, 1909.

CANADA.—Resource Map of the Dominion of Canada. Scale, 1:12,000,000= 197.3 miles to an inch. Department of the Interior, James White, Geographer, Ottawa, 1909. In colours, with the resources of the land and of the interior and exterior waters printed in red type. According to this map the Alberta coal field covers nearly half of that province. The map gives a good idea of the distribution of the Dominion's resources. It is bound in cloth with 20 pp. of Canadian statistics.

CENTRAL AND SOUTH AMERICA.

CHILE.—Die Pflanzengeographische Einteilung des Landes. Scale, 1:7,500,000=118.35 miles to an inch. Illustrates "Die Vegetation der Erde," VIII.

Grundzüge der Pflanzenverbreitung in Chile." By Dr. Karl Reiche. Wilhelm Engelmann, Leipzig, 1907. 17 tints used to show the distribution of flora.

CHILE.—República de Chile. Scale, 1:500,000=7.8 miles to an inch. 25°-33° S. Lat.; 68°-72° W. Long. 4 Sheets. Inserts of Islands San Felix, San Ambrosio, Sala i Gomez and Pascua. Oficina de Mensura de Tierras, Luis Riso Patron S. Director, Santiago, 1908 and 1909. The map is among the first productions of the Oficina de Mensura de Tierras, a department which corresponds in leading features of its work with our General Land Office. It was established by the government of Chile last year. The relief is shown by light and shade, hydrography in blue, boundaries and other political detail in red, place names, mining locations and railroads, in operation or projected, in black. Tables and diagrams show areas and density of population in each Province and Department, railroad statistics, geographic coordinates of a number of places and value of trade of the chief ports in 1907. An index to the names on each sheet is printed on the reverse. The work is a very desirable addition to our maps of Chile.

HAITI.—Topographische und Geologische Karte des Zentralen Teiles der Republik Haïti. Scale, 1:150,000=2.38 miles to an inch. By L. Gentil Tippenhauer, 1908. *Pet. Mitt.*, Vol. 55, No. 3, Justus Perthes, Gotha, 1909. The territory included lies between the sea coast near Arcahaie and the boundary at Banica on one side and the Cul-de-Sac plain and Maissade, Cerca-Carvajal on the other. The geology is shown in colours and the distribution of forests and eruptive zones is indicated. Heights are in meters and contours. Illustrates a paper: "Neuer Beitrag zur Topographie, Bevölkerungskunde und Geologie Haitis," by Engineer Tippenhauer.

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OTHER ACCESSIONS.

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